THE IRON TRADE REVIEW

Vol. LVII Cleveland, November 11, 1915 No. 20

Steady Buying of All Products

Continues Throughout the Country, With Heavy Specifying—Prices Advanced and Still Higher Quotations Expected

THE iron and steel markets have been characterized during the past week by very heavy specifications on old contracts and by a steady run of orders rather than by any spectacular transactions. Prices on all products are tending upward.

Pig Iron

The Youngstown Sheet & Tube Co. has purchased 25,000 tons of basic in addition to the large previous orders and a Cleveland company has also taken a round tonnage of basic. The demand for this iron in the central west is strong and a scarcity is likely to develop. There is much more activity in foundry grades in eastern territory, particularly in New England. At Chicago, prices of malleable, foundry and basic have been again advanced 50 cents. In the south, prices are firm and higher. Ohio silveries have been advancing rapidly and are now $4 higher than they were about 10 days ago.

Iron Ore

Efforts of numerous furnace companies to place supplemental orders for ore clearly indicate that there will be a shortage in spite of the fact that ore on docks will be greatly reduced during the winter. Negotiations are now pending for the purchase of some ore on docks and these transactions may fix the price of ore for the coming season. There is a growing feeling that an advance of 50 cents will not be adequate, as mining costs and probably lake freights will be higher next year.

Machinery

New evidence of the great activity in manufacturing munitions is furnished by the drafting of preliminary plans for the organization of a concern with a capital of $50,000,000, which, it is expected, will erect four plants. A large order for machine tools was placed by the Midvale Steel & Ordnance Co., Philadelphia, which is expected to again enter the market on a large scale. Domestic buying of machine tools shows fair activity and includes some business being placed by the railroads. Throughout the country, demand for lathes and other machine tools is far in excess of supply and many concerns, especially in eastern territory, are enlarging their capacity.

Warehouse Prices

The very great activity of the market at the present time is being shown in the tremendous demand at warehouses due to the inability to obtain prompt shipment from mills. Warehouse prices in nearly all centers have been again advanced from $2 to $3 per ton.

Coke

At Chicago, where by-product coke is largely used, plants have been pushed to the utmost, but the product is not sufficient and a shortage of foundry grades prevails. Connellsville coke is quiet, but prices are firm. Virginia coke is strong.

Wire

The announcement of the Steel Corporation's plan to build a wire rod mill at Cleveland is in line with the policy of expansion at the American Steel & Wire Co.'s works, which will need the product of the proposed mill. Wire rods are scarce and prices nominal. Prices of shafting, screw stock and flat wire have been advanced.

Shapes, Plates and Bars

The largest structural contract taken recently is one for 10,000 tons for the new dock of the Duluth & Iron Range railroad at Two Harbors, Minn., awarded to the American Bridge Co. Orders for plates placed in eastern Pennsylvania amount to about 20,000 tons. Some of the Pennsylvania mills are obtaining as high as 1.75c and even 1.85c, Pittsburgh, on plates and a quotation of 2c a pound is apparently not far distant. On shapes, plates and bars, the leading interest will not guarantee to sell at 1.60c after next Saturday and further advances seem probable. The demand from ship builders and car builders is very heavy. On account of the very strong demand for steel bars, bar iron is also in more active demand and quotations are higher.

THE OPEN HEARTH

Face the Law Squarely

THE outrageous seamen's law, passed by the last session of congress, which went into effect Nov. 4, so far as the administration dared to allow it to become effective, has received a solar plexus blow from William F. McCombs, chairman of the Democratic national committee, who says that the law should be repealed. He says he has talked with a great many shipping men, including ship owners and seamen of all ranks, and he believes the act puts an unwarranted burden on the shipping interests. "This is the time, of all times," says Mr. McCombs, "when the American shipping ought to be encouraged so that fresh capital could be induced to enter the shipping business." Mr. McCombs admits that just now we are not a nation of mariners, but he does not agree with the statement made by ex-Senator Burton several months ago that for that reason the American nation cannot build up a merchant marine. Mr. McCombs said that we had such a class at one time and we can build it up again, if American capital would construct ships, but capital won't enter the shipping business with these new burdens added. He heartily approves the suggestion that congress should empower the President to suspend the operation of the law until a commission of shipping men can analyze present laws and suggest proper changes.

While such men as Mr. McCombs are denouncing the La Follette act, the administration is showing that it is afraid of it. Some of the most obnoxious features of the law are being modified by executive sufferance or by liberal construction. *The New York Sun* predicts, however, that the final interpretation of the statute is the task of the courts, not of the executive, because the men who were most active in obtaining its passage will not submit to the weakening of the act without appeal to the courts. The *Sun* adds:

"Executive clemency constitutes an insecure foundation for commercial enterprise. The deliberate non-enforcement of a law provides only opportunities for corruption, blackmail and disorder. Mr. Wilson's duty is not to evade the responsibilities laid on him by the seamen's law or any other enactment. If he believes in it he should enforce it. If he does not believe in it he should advise the congress to repeal it."

The *Sun* is right; the issue should be squarely met. The law should be enforced until it is repealed and no time should be lost in bringing about its repeal.

Failing to Do Their Part

THE FACTS reported by our Birmingham, Eng., correspondent in regard to the failure of many British workingmen to do their part at home in helping their country to win the present great conflict are indeed surprising. The condition is described as the most disheartening feature of present events. Of course, many workingmen have gone to the front, but similar patriotism does not seem to exist with many of those who remain behind. Drunkenness and idleness are prevalent to a shocking extent. While this condition continues in England, Germany has greatly increased its production of steel and the question continues to be asked—what will England do to produce its quota?

France, on account of having so much of its territory held by the enemy, including territory in which are many blast furnaces and iron mines, has had great difficulty in keeping up its production. Many furnaces were blown out immediately following the declaration of war and large numbers of employes at blast furnaces and steel plants enlisted. It was soon found, however, that the services of these workers were needed fully as much at home as in the field. During the past six weeks, the Comite de Forges has been working on the reorganization of the forces in furnaces and steel works and it is expected to have the working organizations at these plants in fine condition at an early date. In fact, the production of steel has already been largely increased. The French are hampered by inadequate supplies of coal and coke, but they can draw on England for these products, and on the whole the outlook for increased production of steel in France is encouraging. It is indeed high time for the English people to become thoroughly aroused and insist that their workingmen, not less than those of France, shall do their full part in helping to insure the success of the allies.

An Inspiring Example

IN THE HEART of a big manufacturing city on the shore of Lake Erie, stands a stately building which towers high among its neighbors. One of the finest in the town, its lofty front, surmounted by a staff from which floats a large pennant, is a landmark of the neighborhood and a point of attraction to the sightseer. And yet, to the thoughtful man, this structure possesses quite another sort of interest than that of the merely architectural or spectacular. It represents to him the real dignity and worth of labor, in a land where these attributes are made the bywords of a thousand insincere and noisy demagogues. It restores a flagging faith in the future of America's toilers, and renews the realization that, after all, in spite of storms of passion and prejudice, the laws of economics are immutable.

This splendid building in Cleveland is the property of the Brotherhood of Locomotive Engineers, and is but one of numerous valuable units in which the

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funds of this powerful order are invested. In addition to large office space and a number of stores, it contains an auditorium of generous dimensions, one of the finest in the city. The structure is an earning property, whose income goes to the Brotherhood.

The Brotherhood of Locomotive Engineers is perhaps the strongest organization of its kind in the nation. Although it makes no outrageous demands for enrollment, nearly all the engineers in the country are among its members. One seldom hears of strikes or similar troubles among the fraternity of the throttle, and yet the opinions and requests of this body receive the most prompt and respectful consideration from employers The rate of remuneration is high, even considering the arduous nature of the work and the immense responsibility it entails. Referred to by the masters of industry, regarded as a model by other branches of labor, wealthy in its own right, the Brotherhood of Locomotive Engineers is indeed a trade union worth studying.

What is the secret of this organization's success? Why should it possess more power than, say, the metal workers or the textile weavers or the structural ironworkers? This question, asked by the employer who, while trying honestly to do what is right by his men, has half lost faith in human nature, may be answered by the word *responsibility*.

The Brotherhood stands responsible for the men it admits to membership, but is not hampered by narrow ideas about a closed shop. They must prove themselves worthy of its recognition as competent railway engineers before they receive the badge. And, knowing that its membership is sound, the union is not afraid to bespeak its just dues from the men who employ. These, in their turn, are able to deal with an organization which guarantees the standing of its members and does not say that they shall not work alongside non-union men. The big business man is pretty nearly always a fair-minded individual; he has to be, in order to hold his own in the race of competition; and he would much rather grant the honest demand of an honest organization than wage a miserable, sordid fight with a thoroughly irresponsible labor union. But he also possesses a keen sense of justice and will fight to the last before yielding to an unfair demand.

The average trade union takes into its fold any and all who seek admission; indeed, many unions gather in their flocks by numerous methods which will not bear the light. The agitator, generally a stranger to the city and employer under fire, impudently formulates a mandate on behalf of a heterogeneous body, insisting that this one be reinstated and that the other be not discharged, with no thought at all as to the worth or lack of worth of inefficient employes. Union membership is the only test. Furthermore, the very fact that an employer, who by the nature of his business is heavily responsible, should be compelled to treat with a mob whose leaders have not the decency to insure the character of their following, is monstrous. This condition has existed for many years. Thousands of employers have been forced to surrender to the demands of such "organization" as this.

The law of compensation is very old, but it is likewise deadly certain. Whatever has been gained by pseudo-organized, irresponsible labor unions, using the weapons of injustice, will have to be requited. Perhaps, some day, when the agitators have all been sent to their own place and the employer has steeled himself to stand for his own rights as sturdily as he does for those of his men, "organized" labor will begin to realize that there are two sides to every question. Then, with the dawn of mutual responsibility and regard, the true industrial co-operation will begin.

Some people are capable of joking even about war. Recently many newspapers published a story that "Baillie & Wood", of Hamilton, Ont., had magnanimously offered to manufacture munitions without profit. A high representative of the imperial government was quoted as making public this offer of the alleged Hamilton firm. Investigation by our Toronto correspondent shows, however, that no such firm is known and it is evident that the story is a yarn without any foundation in fact.

Furnaces Are Right

THE controversy as to what, if any, compensation should be granted the railroads for handling blast furnace slag still remains to be determined. For several months, blast furnace operators have been quietly pigeon-holing bills received from the railroads, amounting to about $50 per day for a good sized furnace. When asked by these operators to furnish information as to the destination of the slag, railroad companies have uniformly declined to give the facts. If this information were furnished, it could be shown whether the railroads were put to expense without deriving any benefit, or were making use of the slag. In the former case, a reasonable charge would doubtless be paid by the furnaces, but if the railroads are using the slag to make fills or for other purposes, they certainly are entitled to no compensation. We believe that the furnaces have taken the correct position in resisting the payment of bills until some competent authority has decided what charges are just and proper.

Prices Present and Past

Quotations on leading products November 10, average for October, 1915, average for August, 1915, and average for November, 1914. Prices are those ruling in the largest percentage of sales at the dates named.

	Prices Nov. 10, 1915.	Aver. for Oct., 1915.	Average for Aug., 1915.	Aver. for Nov., 1914.
Bessemer pig iron, Pittsburgh..	$17.45	$16.95	$15.89	$14.70
Basic pig iron, Pittsburgh.....	16.45	15.95	14.89	13.45
No. 2 Fdy. pig iron, Pittsburgh	16.95	15.57	14.70	13.70
Northern No. 2 Fdy., Chgo....	17.00	14.44	13.38	13.00
Lake Superior Charcoal, Chgo..	17.25	16.25	15.75	15.75
Mall., Bess., Chgo.....	17.00	15.12	13.38	13.00
Southern No. 2, Birmingham...	13.00	11.87	11.25	9.88
Southern Ohio No. 2, Ironton..	16.00	14.88	14.25	12.63
Basic, eastern Pa.....	17.75	17.50	15.25	13.50
No. 2X Virginia furnace.....	14.50	13.75	12.75	12.50
No. 2X foundry, Philadelphia...	16.75	16.25	15.00	14.25
Ferro mang., Balti., (prompt)..	98.00	105.00	100.00	68.00
Bessemer billets, Pbgh.....	28.00	25.50	23.00	19.00
Bess. sheet bars, Pbgh.....	28.00	25.50	24.00	19.50
Op.-h'th sh. bars, Pbgh.....	29.00	26.50	25.00	19.50
Open-hearth billets, Pbgh.....	29.00	26.50	24.00	19.00
Steel bars, Chgo.....	1.79	1.59	1.49	1.25
Steel bars, Pittsburgh.....	1.60	1.41	1.30	1.10
Iron bars, Philadelphia.....	1.60	1.55	1.40	1.15
Iron bars, Cleveland, local del'y.	1.50	1.39	1.22	1.20

	Prices Nov. 10, 1915.	Aver. for Oct., 1915.	Average for Aug., 1915.	Aver. for Nov., 1914.
Iron bars, Chgo. mill.....	$1.45	$1.37	$1.23	$0.98
Beams, Chgo.	1.79	1.59	1.49	1.25
Beams, Pittsburgh	1.60	1.41	1.30	1.10
Beams, Philadelphia	1.759	1.559	1.459	1.25
Tank plates, Pittsburgh.....	1.60	1.42	1.30	1.07
Tank plates, Chicago.....	1.79	1.55	1.44	1.25
Tank plates, Philadelphia.....	1.759	1.559	1.459	1.25
Sheets, blk., No. 28, Pbgh.....	2.20	2.05	1.83	1.85
Sheets, blue an., No. 10, Pbgh.	1.70	1.60	1.36	1.35
Sh., galv., No. 28, Pbgh.....	3.70	3.50	3.93	2.85
Wire nails, Pittsburgh.....	1.85	1.76	1.61	1.55
Connellsville fur. coke, contr....	2.50	2.25	1.75	1.69
Connellsville fdy. coke, contr...	3.00	2.48	2.25	2.25
Heavy melting steel, Pbgh.....	15.00	14.00	13.38	10.30
Heavy melting steel, east'n Pa..	14.50	14.50	13.50	9.50
Heavy melting steel, Chgo.....	12.50	11.56	11.50	8.25
No. 1 wrought eastern Pa.....	16.00	16.00	14.50	11.50
No. 1 wrought, Chgo.....	12.50	10.68	10.12	7.50
Rerolling rails, Chgo.....	14.00	13.25	11.75	9.50
Car wheels, Chgo.....	12.50	11.75	11.38	10.00

(For Additional Prices See Page 964.)

Heavy Buying of Pig Iron in East

Foundry Iron Demand in New England is Active—Quiet at Pittsburgh, But Valley Prices on Foundry Are Higher

New York, Nov. 9. — The heaviest buying movement in pig iron that the metropolitan and adjacent territories have witnessed in several weeks is now in full swing. Foundry iron, which has been lagging of late in eastern districts, now is furnishing the basis for this movement, although heavy lots of malleable, basic and other grades also are being sought. New England has been an active center. Such leading buyers as the H. B. Smith Co., Westfield, Mass., the Whitin Machine Co., Whitinville, Mass., and the Draper Co., Hopedale, Mass., have taken about 20,000 tons of foundry for early and forward delivery. Much of the iron taken by these three buyers and by other New England consumers recently will be furnished by Virginia makers, who at recent prices of $13.75 to $14, furnace, for No. 2X have been able to quote $17 upward, delivery New England, or considerably under the quotations of northern makers. Some Virginia furnaces since have raised their prices to $15, for No. 2X and others are entirely out of the market. Buffalo and eastern Pennsylvania irons at present are quoted at from $18 to $19, delivered New England. One important Buffalo interest has advanced to $16.50, furnace, for No. 2X for first half. Tidewater prices are higher and range from $16.50 to $17, for No. 2X for early shipment. The Eastern Malleable Iron Co., or Malleable Syndicate, has entered the market for its requirements and probably will take 30,000 to 40,000 tons of this grade. A Phillipsdale, R. I., maker is out for 5,000 tons of basic and a Newark pipe maker for 1,000 tons of foundry for first quarter. The Virginia Iron, Coal & Coke Co., which has withdrawn from the market on No. 2X, again advanced its prices yesterday, quoting $14.50, furnace, on No. 2 plain for this year's shipment, $14.75 on first quarter and $15, on first half; $14.25, furnace, on No. 3 foundry for this year's shipment and $14.50 for first quarter and $14.75 for first half and on No. 4 and forge, $14, furnace for this year's shipment, $14.25 for first quarter and $14.50 for first half. A New England consumer yesterday closed for 4,000 tons of northern foundry iron for prompt shipment. A Paterson, N. J., consumer, who was in the market for 2,400 tons of foundry, placed a portion of this tonnage and now is shopping for the remainder.

Export sales are comparatively few. New York exporters have out a new inquiry for 20,000 tons of hematite for France. Another export inquiry involves 2,000 tons of bessemer iron for the earliest possible shipment.

Demand Very Active

Philadelphia, Nov. 8. — Although comparatively few large sales are reported, demand for pig iron has continued exceedingly active during the week and a large amount of business in the aggregate was booked in this territory. As a result, the output is sold up still farther into the future and prices continue to reflect a strong hardening tendency. On No. 2X northern iron, $16.75, Philadelphia, now appears to be the minimum for shipment over the remainder of this year, while on next year's shipment prices range about $1 per ton higher. None of the furnaces are willing to book business beyond first quarter. The biggest purchase of foundry iron during the week was that by a Johnstown, Pa., consumer, who took 1,000 tons. The Baldwin Locomotive Co. put out an inquiry for 7,000 tons of No. 2X and No. 3 foundry, deliveries beginning in November and running into the first quarter. A Reading hardware manufacturer is in the market for 1,000 tons of foundry and a Wilmington interest also has inquired for 1,000 tons. A number of furnaces

(*For complete prices see page* 964.)

temporarily have withdrawn from the market. Virginia iron is sold up to such an extent that one Virginia furnace has withdrawn entirely while another is unable to book any further business in No. 2X. Standard low phosphorus last week again enjoyed a heavy demand and among the business booked was one sale of 5,000 tons for export. Standard low phosphorus continues to be quoted at $28 to $29, Philadelphia. Lebanon low phosphorus has been sold up through the rest of the year and through much of the first half. Lebanon low phosphorus iron now is quoted at $26 to $28, furnace. Good sales of malleable were reported, including two which together totaled 1,500 tons. Following these sales, prices were advanced and now are equivalent to $16.50, Buffalo. Demand for gray forge iron was quiet, owing to the fact that puddlers in this territory are not active. There has been a letup in the demand for basic, due to the fact that the recent heavy buying has left consumers fairly well covered for the time being. Sales of basic have been made the last few days at $18. A Williamsport, Pa., buyer last week closed for 1,000 tons of basic for February-March delivery at $18, delivered.

Quiet After Excitement

Pittsburgh, Nov. 9.—After an excited buying movement which extended over five or six days, the pig iron market in western Pennsylvania and eastern Ohio is comparatively quiet, but prices are hardening on all grades. Basic pig iron is firm at $15.50 and some dealers are asking $16, valley. Small lots of bessemer iron have been sold at $16.50, valley, and that figure appears to represent the minimum price. The Youngstown Sheet & Tube Co. last week took approximately 100,000 tons of steel-making grades, having purchased about 25,000 tons since last Tuesday. A Cleveland furnace has sold to Otis Steel Co. a round tonnage of basic at $16, furnace. A western consumer has purchased 500 tons of off grade basic iron at $15.75, valley, for immediate shipment. A Shenango valley blast furnace interest has sold 3,000 tons of bessemer iron for foreign delivery, at $16.25, furnace, but an option on the iron involved was obtained before the beginning of the recent pig iron buying movement. It develops that the Wheeling Steel & Iron Co., Wheeling, W. Va., did not figure in the market last week, as generally reported. Foundry and malleable grades are being held at $16, valley, by most sellers. A local car company is negotiating for first half foundry iron requirements.

Chicago Iron Up Again

Chicago, Nov. 9.—Foundry, malleable and basic pig iron are now quoted at $17, Chicago furnace, for any delivery to July 1. The advance from $16.50, furnace, during the past week did not result in cessation of inquiry and selling in small tonnages continues unabated. No large inquiries are before the market except one tentative sounding of the market, which is not expected to result in a sale.

One interest is asking $18, furnace, for its product, but is practically out of the market and does not desire to assume further tonnage at present. Its output for first half is practically disposed of with only a small tonnage remaining, which will be utilized in relieving the necessities of old customers who become hard pressed.

It appears from present indications that a further advance may be made at any time. Two additional stacks will be put in blast Dec. 1, the Illinois Steel Co.'s merchant stack at Bayview, Milwaukee, and one Federal stack at South Chicago. These two are the only idle stacks in this territory which can be put into service before spring. Lack of higher silicon iron from northern stacks has resulted in an unusual demand on southern Ohio and Birmingham silveries and prices are unusually high, southern Ohio iron being practically unobtainable at any price. Southern silveries 5 to 6 per cent are now quoted at $16, Birmingham.

Advances continue on Virginia iron and the following schedule has been issued by the Virginia Iron, Coal & Coke Co., under date of Nov. 8:

	1915,	First quarter and half,	Third quarter alone,
No. 2X	out.	out.	out.
No. 2 plain.....	$14.50	$14.75	$15.00
No. 3 foundry.....	14.25	14.50	14.75
No. 4 fdy. & forge	14.00	14.25	14.50

Lake Superior charcoal iron is quoted at $17.25 to $17.85, delivered, Chicago, for the full range of grades. No. 1 is $17.75, delivered, Chicago; Nos. 2 to 5, $17.25, Chicago, and Scotch at $18.25, Chicago, in the schedule of one seller, while another maker is asking 50 cents per ton higher than these figures. The charcoal market apparently has not steadied to a uniform level under the pressure of present buying.

Southern foundry iron is being quoted at $13 to $13.50, Birmingham, for delivery during this year, and $13.50 to $14, Birmingham, for first half. A recent sale was made in this territory at $13.50 for first quarter, and $14 for second quarter.

Basic Bought

Cleveland, Nov. 9.—Heavy sales of pig iron have been made during the past week, including a round tonnage of basic at $16, Cleveland furnace, to a northern Ohio steel company, for delivery in the first quarter and first half of next year. Another buyer has not yet been able to place an order for 10,000 tons of basic. Furnaces are now finding themselves so well sold up that the tonnage available for sale for delivery prior to July 1 is small and prices are firmer. Apparently $16 is the lowest quotation on No. 2 foundry in the valley and recent advances at Buffalo and Toledo are being adhered to.

Silvery Iron Advances

Cincinnati, Nov. 9.—The pig iron market is steady and strong. Inquiries are very light and scattered, and sales to melters in this territory are very scarce, but prices show no tendency to sag. Consumption and shipments on old contracts are very heavy, and a number of stacks in the south and southern Ohio have withdrawn from the market until after the first of next year. No. 2 foundry iron is quoted at from $13 to $13.50, Birmingham basis, and at $16, Ironton basis, for prompt or first quarter delivery, and in some cases $13.50 and $16 can be done for the second quarter. General quotations for the first half are from $13.50 to $14 for southern iron and $16 for southern Ohio grades.

Silvery iron today advanced to $23, furnace, for 8 per cent silicon for first quarter, and $24 for second quarter. Bessemer ferro-silicon advanced to $25, furnace, for first quarter, and $26 for second quarter.

Gaining Every Day

Birmingham, Ala., Nov. 8.—The Birmingham pig iron market apparently is gaining in strength every day. Spot iron now is quoted everywhere at $13 for No. 2 foundry. One interest has advanced to $14 for delivery through the first half; others are asking $13.50.

Practically every furnace that can be operated is now in blast in the Birmingham district. By Nov. 15 the Tennessee Coal, Iron & Railroad Co. hopes to blow in the fourth furnace at Bessemer. It is reported here that there have been exceptionally large inquiries from Europe for finished materials, thus necessitating still more furnaces operating on basic iron and further strengthening the foundry iron market.

It is understood that stocks for

(*For complete prices see page* 964.)

October showed a very slight increase, but makers state this is not significant. They say that the movement of iron is exceptionally good, shipment on orders now being booked being made just as fast as the railroads can furnish cars.

Improved Inquiry

St. Louis, Nov. 8.—The pig iron market in this district gives evidence of considerable improvement. There is an inquiry out for 5,000 to 10,000 tons of basic iron, and scattering inquiries, amounting perhaps to 15,000 tons, of various grades of iron.

Sales last week probably amounted to 10,000 tons, including one for 1,000 tons of southern No. 2, and two other sales of 600 tons each of southern No. 2.

Prices have advanced and southern No. 2 is now held, generally, at $14, Birmingham basis, for delivery up to April and at $14.50 for second half delivery. Northern iron is quoted at $17, Chicago. Lake Superior charcoal iron has advanced $1 a ton.

Billet Prices

Show Wide Range—Higher Quotations at Pittsburgh

Philadelphia, Nov. 8.—The billet market in this territory is featured by widely varying prices. One maker has sold several good-sized lots of forging billets at $55. An eastern mill has made a number of sales to regular customers at $45, mill, but has obtained as high as $48 from other consumers. These sales embrace deliveries over the rest of this year and first quarter, which positions are practically sold up. Open hearth rolling billets, which are sold up for the same period, have sold at $35, eastern mill. Some sales of bessemer rolling billets are reported at $28 to $29, mill. On wire rods $38 can be obtained without difficulty for delivery over the year and first quarter.

Bessemer More in Demand

Youngstown, O., Nov. 9.—The past 30 days have seen a complete change in the bessemer steel situation. Many consumers have found their requirements sufficiently flexible to permit them to turn from open hearth to bessemer steel and a considerable inquiry for bessemer billets is in the market. Sheet makers are diverting all possible business to bessemer steel. One producer of open hearth sheet bars and sheets is reported to have taken a round tonnage of bessemer sheet bars to supply its sheet mill requirements while its open hearth output is disposed of otherwise. Bessemer steel prices are stronger at $26 to $27 for billets, Youngstown, and $27 to $28 for sheet bars, prompt delivery.

The market for open hearth steel is growing steadily tighter. Many regular customers are covered for the first quarter, for producers are making every effort to take care of their home trade. Consumers themselves say that it is not a question of having their requirements covered, but of the prices which they may be compelled to pay with a continuance of the present economic conditions. Open hearth billets and sheet bars nominally are quoted $28 to $30 for prompt delivery.

Higher at Pittsburgh

Pittsburgh, Nov. 9.—Semi-finished steel products reflect increased strength. Billets are reported to have sold at $28, mill, and several manufacturers are asking $30, mill, for sheet bars. Rather heavy tonnages of billets have been sold recently for the manufacture of war material, it being understood that as high as $55, mill, has been paid for about 20,000 tons. Wire rods are scarce and principal manufacturers have withdrawn from the market. Muck bar nominally is quoted at $30, Pittsburgh.

Rivet Advance

Looks Pretty Stiff to Some Buyers—Bolts and Nuts Active

Cleveland, Nov. 9.—The recent advance in rivets to a basis of 2.25c and 2.35c, respectively, on structural and boiler rivets, has not yet been tested as contracts do not expire before Jan. 1. It is believed, however, by some buyers that the rapid advance is greater than justified by the price of bars. Some contracts expiring Jan. 1 were made at 1.50c and 1.60c, and at that time bars were quoted at 1.20c. Bars have now advanced $6 a ton and rivets have been marked up from $15 to $17 per ton. Doubtless there will be some contracting within a few weeks, which will test the new prices. The demand for bolts and nuts is active and recent advances seem to be justified by the demand and by the price of bars.

Nuts, Bolts and Rivets

Pittsburgh, Nov. 9.—Advanced prices adopted by nut and bolt makers ten days ago have been established. Specifications are heavy and inquiries are more numerous. Fairly heavy tonnages are being shipped to South America and far eastern countries. The recent advance in the price of steel bars probably will be followed by an advance for nuts and bolts.

(*For complete prices see page* 964.)

Ore Shortage

Will be Experienced by Some Furnaces—Ore Moving Freely

It is clear now that some of the furnaces are going to be caught short of ore, as they have been unable to place orders with shippers for this year's delivery. It is absolutely impossible for the shippers to get additional ships and with vessel tonnage so scarce, they are reluctant to send forward from the mines to shipping docks more ore than they can get vessel capacity to transport. The shortage, of course, will have to be made up from the ore reserve on Lake Erie docks and it is likely that when navigation opens next spring, the docks will be cleaner than they have been for 15 years. One ore firm alone the past week could have sold several hundred thousand tons of ore.

Furnaces are taking ore freely from Lake Erie docks and the burden will not be great upon them on Dec. 1. While ore shipments to Nov. 1 were 10,000,000 tons greater than they were last year, the amount on dock Nov. 1 was scarcely more than it was last year. The ore has, in fact, been going into cars practically all season and very little of it has touched the dock at all. Lake Erie docks are expected to be pretty clean by the close of the season. Receipts at the different Lake Erie ports during October were:

Port.	October, 1915.
Buffalo	834,114
Port Colborne	28,284
Erie	137,481
Conneaut	1,150,744
Ashtabula	1,187,847
Fairport	270,227
Cleveland	1,246,899
Lorain	429,115
Huron	108,632
Toledo	251,397
Detroit	96,436
	5,741,176

Tubular Goods Quiet

Pittsburgh, Nov. 9.—The market for iron and steel pipe is quiet in western Pennsylvania and eastern Ohio. Advanced prices, announced Nov. 1 by the National Tube Co., have been adopted by all makers in the Greater Pittsburgh district. No large orders have been placed recently and no new inquiries of importance are reported. Specifications for boiler tubes continue to come out in heavy volume. Demand for seamless tubing is decidedly heavy; shipments are deferred three of four months.

The La Belle Iron Works, Steubenville, O., has taken an order for steel rounds for foreign shipment. Details are not announced.

Heavy Inquiry for Bars

Includes One for 100,000 Tons for Export—Bar Iron Advances Owing to Shortage of Steel

Philadelphia, Nov. 8.—Large inquiries for shell rounds continue to be circulated in this market. The largest single inquiry involves 100,000 tons for export to a country which previously has not figured here in the purchase of steel for manufacturing war munitions. Several other new inquiries involve 30,000 to 40,000 tons each, but it is likely that some of these are duplicates. Generally, 3.50c, Pittsburgh, is considered as the market for shell rounds, but one maker would do no less than 3.75c. Steel bars for prompt shipment now are quoted nominally at 1.60c, Pittsburgh, but the market is practically sold up. At least two makers now are in such a position that they are unable to take bar business for delivery before next April. In some cases, prompt small lots have brought as high as 1.70c, Pittsburgh.

Iron bar makers are experiencing a big increase in demand due to the shortage of steel bars. For prompt shipment they are quoting nominally 1.50c, mill, or 1.57½c to 1.62½c, Philadelphia, but it is a fact that a great deal of the business is going at somewhat higher prices. While the iron bar mills have all they can do to meet the current demand, they are abstaining as much as possible from entering forward contracts, due to a belief that better prices will continue to develop.

Demand for shafting continues active and last Friday the price was advanced. Leading makers now ask 55 off the list of March 15, for carloads, and 50 off for less than carload lots, Pittsburgh.

Clamoring for Rounds

New York, Nov. 9.—Big inquiries for large rounds and blooms for making shells continue to come out in this territory, but, as far as known, no bookings have resulted. The mills now regard 3.50c, mill, as the lowest price for shell rounds. Demand from the regular bar trade is active, but very little business is reported due to the extent to which the mills are sold up.

Steel Bars Put Up $2 a Ton

Pittsburgh, Nov. 9.—Steel bars last week were advanced $2 a ton and are now held at 1.60c by the Carnegie Steel Co., the Jones & Laughlin Steel Co., the Cambria Steel Co. and other manufacturers in this district. Specifications are coming out in heavy volume and deliveries are deferred from four to six months. Shrapnel rounds have been offered at 3c, mill, although larger sizes are being held at above that figure. Bar iron is being held at 1.60c by mills in the Greater Pittsburgh district.

May Be Another Advance

Cleveland, Nov. 9.—Specifications on bars are very heavy. The Carnegie Steel Co. will not guarantee to sell shapes, plates or bars at 1.60c after the close of business Saturday of this week, and the outlook is that there will be another advance on that date.

Steel Bar Market Closed

Chicago, Nov. 9. — The leading interest and the leading independent in this market have withdrawn quotations and announce they have no more tonnage to sell for delivery up to July 1. A nominal quotation of 1.79c, Chicago mill, is carried, as this represents the most recent business placed. While the condition reflected by withdrawal of quotations indicates no more steel can be obtained, it is probably true that some small tonnages will be placed from time to time in emergency when they can fit into rolling schedules. The independent steel maker in Chicago is out of the market on plates, shapes, bars, sheets and track supplies, as it has contracts to absorb its entire crude steel output.

No interest has been shown so far in second half business by mills or consumers and as a result sales departments are idle.

Iron Bars Steady

Chicago, Nov. 9.—Conditions are unchanged in the bar iron market in Chicago, the quotation remaining firm at 1.45c, Chicago mill, with a probability it will be advanced before the end of the month. Specifications continue to come to mills in considerable volume and some mills now have sufficient tonnage specified to care for their output practically to the end of the year. Other mills not quite so fortunately situated are running steadily at full capacity.

Hoops, Bands and Shafting

Pittsburgh, Nov. 9.—Cold rolled steel shafting has been advanced $3 a ton to a basis of 55 per cent off the list for carload tonnages, the highest figure to prevail for nine years. Mills are not in a position to promise additional material the first six months of 1916. Steel bands were advanced $2 a ton last week by the Carnegie Steel Co. and now are being held at 1.60c. Steel hoops are strong at 1.75c.

(For complete prices see page 964.)

Ferro is Easier

And Prices Are Somewhat Irregular—Recent Arrivals

New York, Nov. 9.—Price irregularity, especially for early delivery, attests a continued easier situation in ferro-manganese. In the east, moderate-sized sales for prompt or nearby shipment continue to be made at from $98 to $100, seaboard. It is understood, however, it would not require much buying to clean up the material that is available at $98. The most familiar price has been $100, delivered. One lot of 150 tons for spot shipment was placed yesterday at $100, seaboard. There have been reports that as low as $90, seaboard, has been done in other districts, but no trace of such severe shading has been discovered in eastern territory. Forward ferro-manganese is steady at $100, seaboard. A middle western steelmaker is in the market for 1,200 to 1,500 tons for first quarter. As a rule, however, consumers are pretty well covered and current inquiries do not involve requirements beyond the next couple of months.

English shipments continue to come in more freely and this has helped the situation materially. Shipments have been coming in, however, at only about half the rate promised, which leads some sellers here to believe that unless domestic production increases, it is likely the premium may be restored. The Swanmore brought in about 500 tons during the past week, which were licensed in October. The Malvern Range will sail within a few days with about 2,000 tons, which have been licensed for October. One lot of approximately 50 tons arrived on the Cymric a few days ago. The Mechanician is expected at New Orleans shortly with a lot of 50 tons, and perhaps more, aboard.

Lower Grades Advanced

Pittsburgh, Nov. 9.—Sellers of bessemer ferro-silicon have advanced prices $2 a ton for first quarter delivery and are asking premiums of $2 a ton for shipment this year. Twelve to 13 per cent material is being held at $27, furnace. Active demand is reported and some furnaces practically have withdrawn from the market for

delivery the first four months of 1916. Demand for ferro-manganese is more active. Material is being held at $100, seaboard, and above. Fifty per cent ferro-silicon reflects strength. Quotations for steel-making metals are nominal. Several lots of spiegeleisen have been sold this week at $28, furnace.

Warehouses Busy

And Prices Are Advanced From $2 to $3 Per Ton

Chicago, Nov. 9.—Advance of $2 per ton was announced Monday by Chicago warehouses. The new price level puts steel bars at 2.10c, Chicago store, small shapes and plates 2.20c and No. 10 blue annealed sheets 2.40c. St. Paul warehouses sell at 10 cents higher than this level and St. Louis warehouses at 5 cents higher. Warehouses have advanced rivets to a basis of 2.40c, Chicago store, on structural rivets in 200 pound kegs and 2.50c, Chicago store, on 100 pound kegs. This figure is more in keeping with conditions than the former situation when Chicago warehouses were selling from store at approximately the same price asked by mills in Pittsburgh.

Warehouse business in this city is increasing proportionately as mill deliveries become more remote and indications are domestic business is in much better position and asking larger tonnages of material from store than for some time.

Marked Up $3

Cleveland, Nov. 9.—Warehouse business is very heavy and prices on shapes, plates, steel bars, bar iron and No. 10 blue annealed sheets have been advanced $3 per ton. No change has been made in quotations on galvanized sheets. The demand for structural material from store is especially heavy.

Advance at New York

New York, Nov. 9.—Warehouse prices in the metropolitan district again have advanced $2 a ton, in line with rising mill prices and the strong pressure from buyers for material for early shipment. Steel bars from store now are held at 2.15c, delivered in the metropolitan district, and plates and shapes at 2.20c. This is the second advance of $2 within a few weeks.

Three Dollars Higher

Pittsburgh, Nov. 10. (By wire.)—Warehouse prices have been advanced $3 per ton at Pittsburgh. Plates and shapes are now held at 2.25c and bars at 2.15c. Rounds and squares, 2 inches and over, are quoted at 2.45c at warehouses.

Plates for Cars and Boats

Make Large Tonnage—Prices Are Advancing —Heavy Orders in the East

Philadelphia, Nov. 8.—Demand for plates continues of record proportions and bookings of the week embraced fully 20,000 tons. At the same time, prices continued to show a strong upward tendency. One eastern Pennsylvania mill now is booking small orders for prompt shipment at 1.80c, Pittsburgh, while 1.70c is this company's inside price on attractive business. Western Pennsylvania makers now regard 1.60c, Pittsburgh, as their minimum quotation, and on such material as they can ship from stock they are doing 1.85c. All the plate mills are refraining as much as possible from tying themselves up with contracts. The Chester Ship Building Co., which has taken contracts for four large vessels, two for Norwegian shipping interests, let the plates to an eastern Pennsylvania mill and the shapes to a western Pennsylvania maker. The Standard Oil Co. placed a tanker with the Newport News Ship Building & Dry Dock Co., the 8,000 tons of plates and shapes being divided between the same two mills, the plates going to an eastern Pennsylvania concern and the shapes to a western Pennsylvania maker. The same interest let two tankers to the Harlan & Hollingsworth Corporation, the plates and shapes, aggregating 7,000 to 8,000 tons for each vessel, being divided between the same two mills. A large demand for plates is coming from the concerns which recently have booked large car orders from the railroads. The Southern Pacific Steamship Co. is inquiring on two 12,000 to 15,000-ton boats.

Plates Advanced $2

Pittsburgh, Nov. 9.—Steel plates last week were advanced $2 a ton by the Carnegie Steel Co. and now are being held at 1.60c, or $4 a ton above the price prevailing before Oct. 15. Since Jan. 1, plates have advanced $10 a ton. Talk of higher prices is heard. Shipments are deferred from four to six months. Specifications from domestic consumers are increasing in volume.

Plates are Higher

Cleveland, Nov. 9.—The plate market is very firm with 1.60c as the minimum, while eastern Pennsylvania mills are quoting 1.75c and state that in all probability the quotation will be 1.85c, Pittsburgh, at an early date. Some sales have been made at 2c, Coatesville. Another order for a lake vessel has been placed with the Toledo Ship Building Co.

Scarce at Chicago

Chicago, Nov. 9.—Conditions in the plate market have been such that mills no longer can take tonnage for delivery before July 1, except in rare instances. Plates now are equally strong with shapes and bars and 1.79c, Chicago mill, is a nominal quotation representing recent transactions.

(*For complete prices see page* 964.)

Wants Rails

Rock Island in Market for 40,000 Tons—Light Rails Advance

Chicago, Nov. 9.—The Chicago, Rock Island & Pacific railroad is in the market for 40,000 tons of steel rails to be delivered during 1916. Judge Carpenter, of the United States district court, having authorized Jacob M. Dickinson, receiver, to buy this quantity. The permission contained a recommendation that the rails be bought as soon as possible because of the busy condition of the steel industry.

In the present condition of rail mills at Chicago and in the east it is believed the Rock Island must take delivery after July 1 on these rails, if they are bought east of the Mississippi. Possibly the tonnage may go to the Colorado Fuel & Iron Co., which possibly may be able to give better delivery, but this would necessitate a longer haul for most of the tonnage.

Light Rails Advanced $2

Pittsburgh, Nov. 9.—The Carnegie Steel Co. and other manufacturers of light rails have advanced quotations 10 cents per 100 pounds and are now quoting 25 to 45-pound sections at 1.45c. Light rails have been advanced three times, or approximately $6 a ton, the last 60 days. Railroad spikes have been put up $2 a ton and now are being held at 1.85c for standard sizes.

Will Double Capital

Chicago, Nov. 9.—Stockholders of the By-Products Coke Corporation, which recently absorbed the Federal Furnace Co. at South Chicago, will hold a special meeting Nov. 30 to double the capital stock of $5,000,000 and confirm the action of directors in taking over the Federal Furnace Co.

Sheet Prices Vary Widely

Differentials on Galvanized Disturbed by Spelter Market—Demand for Bessemer Improves

Youngstown, O., Nov. 9.—Quotations for all descriptions of steel sheets for all positions cover a wide range. On galvanized sheets, for instance, as low as 3.70c and as high as 4.20c for No. 28 gage, Pittsburgh, and actual sales at 4c are reported of standard sizes. The differentials between gages continue upset by the abnormal spelter situation and while a consumer may secure heavy gages of galvanized sheets at comparatively low prices, he must pay exceedingly high for the light gages. Valley makers state that demand for galvanized sheets is around 60 to 70 per cent of normal. Most mills are covered under contract for acid, but in one or two cases, if the present scarcity and high prices continue, production of galvanized sheets may be curtailed.

Producers of blue annealed sheets are booked to capacity in most instances for months to come. The leading interest is reported out of the market. While the quotations of this company range from 1.70c to 1.80c for prompt and first quarter delivery, tonnages have been disposed of recently at 1.90c for prompt delivery by valley makers and most sellers say they would accept no business for first quarter under that figure. Prompt quotations range from 1.80c to 1.90c, with occasionally premiums paid for spot shipment from warehouse.

Demand for black sheets has shifted to a great extent from open hearth to bessemer material, largely because of the higher prices prevailing as a result of the present scarcity of open hearth steel. It is estimated that not more than 15 to 20 per cent of the sheet business necessarily must be open hearth because of the nature of product into which the material is manufactured. Thus a large channel for consumption of bessemer steel is being reopened, with corresponding decrease in the call for open hearth. Bessemer black sheets are quoted 2.15c to 2.25c and open hearth 2.25c to 2.30c, Pittsburgh, for No. 28 gage. Sales of bessemer sheets for first quarter have been made at 2.35c for No. 28 gage.

Inquiry for black and blue annealed sheets both for export and domestic account continues heavy, in comparatively small individual lots.

Sheet Mills Busy

Pittsburgh, Nov. 9. — Pressure for steel sheets is decidedly heavy. Specifications for galvanized material are coming out in good volume and the tendency of prices is upward. Most mills are quoting No. 28 gage galvanized sheets at a spread from 3.70c to 3.80c. The leading interest is asking 2.20c for No. 28 gage black sheets for shipment the remainder of the year. Blue annealed sheets are commanding 1.70c for No. 10 gage for prompt delivery.

More Than Mills Can Handle

Philadelphia, Nov. 8.—Eastern Pennsylvania sheetmakers continue to quote 1.80c, Pittsburgh, or 1.959c, Philadelphia, for No. 10 blue annealed to their regular customers. Other consumers, however, are asked to pay 1.90c, and this figure already has been done in several cases. These prices extend through first quarter and beyond that the mills do not care to go. In a few cases, however, some first half contracts have been taken at an advance of $2 per ton for the second quarter. Business continues to be offered in much greater volume than the mills can handle it.

Active in Cleveland

Cleveland, Nov. 9.—Demand for sheets continues active and quotations range from 1.80c to 1.90c on No. 10 blue annealed, while quotations on No. 28 black range from 2.10c to 2.20c, Pittsburgh, for bessemer and 2.20c to 2.25c on open hearth.

Grow Scarce at Chicago

Chicago, Nov. 9.—The leading independent sheet maker in Chicago territory has withdrawn all quotations and will not take on further tonnage for the present. Recent contracts show the market is 2.44c, Chicago mill, for No. 29 gage black and 3.99c, Chicago, for No. 28 gage galvanized. Heavy demand for steel to go into other forms of material has somewhat affected the output of sheets and the high price of sheet bars, together with inability to obtain reasonable delivery, has placed many difficulties in the way of sheet makers.

Sheets Advancing

Cincinnati, Nov. 9.—Both black and galvanized sheets are slowly advancing, due principally to the heavy demand for sheet bars from the east, and the general strength of all steel products. Sales are not heavy, as mills will sell only for prompt shipment because of the uncertainty of prices after the first of next year. Black No. 28 gage are quoted at from 2.20c to 2.30c, and galvanized No. 28 gage at from 3.75c to 3.85c, both Pittsburgh basis.

(*For complete prices see page* 964.)

Tin Plate Price Expected Soon

Pittsburgh, Nov. 9. — Manufacturers are being urged to name the price of tin plate for 1916 delivery. Indications are that material will be held at about $3.50 per base box; the market opened last year on the basis of $3.20. Specifications have been brisk, it being apparent that consumers desire to accumulate as much stock as possible under contracts placed at current prices.

Tin Plate Prices

Youngstown, O., Nov. 9.—While the leading interest has not yet established its 1916 tin plate price, recent sales have been far above the usually quoted market levels. Some independents have taken business at 3.30c to 3.40c for nearby shipment. Export business is heavier than ever. Among the uncertainties overhanging next year's tin plate price is the possibility of Great Britain imposing an export duty on tin. If a duty of 10 cents a pound should be placed on this metal, tin plate prices would have to be established above 4c. While most makers have contracted for next year's supply of tin, shipments have not begun from the Straits and thus would come in for any duty imposed.

Buffalo Prices

Have Been Advanced on Pig Iron—Warehouse Quotations Higher

Buffalo, Nov. 9.—For the first time since 1907, Buffalo furnaces are asking that pig iron consumers anticipate deliveries in making up contracts for sales of iron. Price alone is not the ruling factor. Buyers must include just when deliveries are to be made. This is due to sold-up condition of furnaces. Producers say they cannot take on further tonnages unless the matter of deliveries is specifically understood as a part of the contract. One interest is sold up solid over the remainder of this year and the first quarter of next year. Another leading producer is out of the market entirely for the present, having nothing to sell. Prices have advanced to a basis of $16 for No. 2 plain.

The scrap market is strong and prices are advancing.

In finished materials, there is great activity. Warehouse prices have been advanced to 2.20c on steel bars, 2.30c on shapes and plates and 2.70c on hoops.

Steel Scrap

Is Expected to Develop Much Strength—Youngstown Mills Buying

Youngstown, O., Nov. 9.—Both producers and consumers of heavy melting steel scrap expect to see extraordinary strength in this material ere long. Mills have been buying quietly for positions as far ahead as dealers would permit and a large amount of scrap is contracted for. One user recently took more than 60,000 tons. The hundreds of thousands of tons of steel material which are going for export will never be a factor in this country's scrap market and it is expected that this phase of the situation shortly will be exerting a technical effect upon the market.

Heavy Shipments to Mills

Cleveland, Nov. 10.—The rising trend of the scrap market generally is being followed by the market here which is being emphasized by heavy shipments to mills. Consumers are endeavoring to cover as far ahead as it is possible to do, but sellers are contracting cautiously. An advance of $1 a ton in heavy steel to $13.75 to $14.25 is noted and other grades have advanced at varying figures. Prospects are considered good, although spot sales of material have been few.

Scrap Iron Steady

Cincinnati, Nov. 9.—The scrap market is steady following a general advance in prices last week. Cast scrap is selling in good lots, and stove scrap continues to show improvement in demand and consumption. New sales of steel scrap are very scarce, but shipments on old orders are very heavy, especially to rolling mills. The following old materials are the best in demand in this market: Heavy melting scrap, bundled sheet scrap, No. 1 busheling, No. 1 cast, stove plate, and No. 1 machine cast.

Still Advancing

Chicago, Nov. 9.—Prices of iron and steel scrap are advancing steadily and rapidly. The market is entirely in the hands of sellers and consumers must pay the price or do without tonnage. Strong quotations on steel in the east have a great effect on quotations in Chicago and consumers are forced to pay larger prices on this line of scrap to prevent it being shipped to Pittsburgh. As a matter of fact, considerable tonnages are moving to that destination at a profit after the freight has been paid.

Steel car axles continue to be an interesting feature and it is understood a further contract for 5,000 tons for export to Italy has been placed within a few days. It is said these were sold at a price figuring back to $22.50 per net ton Chicago.

Railroads are offering considerable scrap, nine lists being actively before the market at the opening of the week, as follows: Southern Railway, 4,800 tons; Union Pacific, 2,700 tons; Soo Line, 200 tons; Mobile & Ohio, 1,030 tons; Chicago, Milwaukee & St. Paul, 3,200 tons; Michigan Central, 1,380 tons; C., St. P. M. & O., 1,800 tons; Kansas City Southern, 180 tons; Northern Pacific, 1,800 tons and the Wabash Railway, 2,000 tons.

Heavy Melting Reflects Strength

Pittsburgh, Nov. 9.—The market for old materials shows strength. Heavy melting steel is being held at $15.50 by some dealers, although not much material has been sold at above $15. Most mills have enough tonnage under contract to meet needs the next few weeks and a buying movement is not expected until existing contracts have been fully specified against. Eastern consumers are freely buying wrought scrap in this district. Machine shop turnings, which are plentiful, continue irregular and weak.

Slow Recovery

Philadelphia, Nov. 8.—The old material market in this territory reflects no particular activity, but there is a better volume of buying in small lots. At the same time, however, there are no indications pointing to the development of large tonnage buying, which generally follows on the heels of an improvement in small-tonnage buying. Leading scrap dealers say that the scrap market is about the only branch of the steel business in which the improvement of the past few months has failed to be reflected proportionately. They point out that prices, despite a few advances here and there the past two weeks, generally have not yet recovered from the decline which followed the termination of the August buying movement. As a case in point, wrought pipe scrap, which in August sold at $15, now is commanding only $13.50 to $13.75.

Among the features of the past week was a better demand for scrap to be used in place of pig iron, such as No. 1 heavy cast scrap. Car wheels also were in better demand and the price on this description has gone up to $14 to $14.50 per gross ton, delivered. No. 1 forge also is quoted higher at $12 to $12.50. Dealers report it is very hard to get scrap at minimum prices, due to the belief of the sellers that conditions in the scrap market are better than they prove to be in reality.

A large Italian inquiry for scrap, previously reported as being figured on in this market, has not yet been closed due to the high freight rates and the difficulty in securing cargo space.

Very Quiet

New York, Nov. 9. — Old material dealers in this territory report demand during the past week has been very quiet and no new inquiries of importance have come out from consumers. Heavy shipments of scrap recently have been made on old contracts and as a result, due to the congestion at consuming points, embargoes are threatened on further shipments to some mills. Prices are unchanged from a week ago.

Active at St. Louis

St. Louis, Nov. 9.—The scrap markets have been very active all week, and the volume of business transacted has been unusually heavy, with prices pointing upward. The advances are largely brought about by the optimism in the eastern markets, and by renewed buying on the part of large consumers in this district. Relaying rails are scarce and hard to get.

Railroad offerings this week are: Wabash, 2,000 tons; Vandalia, 460 tons; Kansas City Southern, 200 tons.

Flat Wire

Has Been Advanced—Shafting and Screw Stock Higher

Cleveland, Nov. 9.—The American Steel & Wire Co. has announced an advance of three points on shafting and screw stock, the new quotation being 55 off, as compared with 58 off, the old price. Flat wire has been advanced to 3.50c, Pittsburgh, the previous quotation having been 3.25c.

Wire Mills Sold Up.

Pittsburgh, Nov. 9.—Manufacturers of wire products are not soliciting additional orders and most of them have withdrawn from the market for delivery the next four or five months. It is not unlikely that prices will be advanced $1 or $2 a ton in the near future. Heavy tonnages of barb wire continue to be shiped to belligerent European nations.

The plant of the Weimer Machine Works, Lebanon, Pa., was damaged by fire on Nov. 4, entailing a loss estimated at about $100,000. The machine, erecting and pattern-making shops were damaged heavily.

(For complete prices see page 964.)

Premiums Paid on Shapes

Buyers Do Not Hesitate to Pay for Prompt Delivery —Mills Slow to Contract

Philadelphia, Nov. 8.—Shape prices continue to mount upward almost as rapidly as quotations in the plate market. Last week, several contracts with deliveries extending into first quarter were booked at 1.50c, Pittsburgh, and in one case a car builder placed a contract for even less. Since then, the market has gone up generally to 1.60c, Pittsburgh, with some mills showing a marked disposition not to accept contracts or large tonnages. The makers asking 1.60c, further are asking 1.85c on such material as they can ship from stock, and this does not involve a large tonnage. Eastern Pennsylvania makers, however, have raised their price on the general run of shapes to 1.70c, Pittsburgh, and will do nothing less, while on the smaller shapes a premium of $2 or more a ton is asked. These prices pertain to this year's shipment, as eastern Pennsylvania mills are adverse to booking orders for next year. A western Pennsylvania mill has taken the shapes for four large vessels to be built by the Chester Ship Building Co., and for three tankers for the Standard Oil Co. One of the latter vessels will be built by the Newport News Ship Building & Dry Dock Co. and the other two by the Harlan & Hollingsworth Corporation; all involve from 7,000 to 8,000 tons of plates and shapes each.

Small Tonnage

New York, Nov. 9.—Structural lettings in the east have involved a very small tonnage in the aggregate during the week. As a principal cause for the scarcity of new lettings, fabricators assign the rapidly rising prices, which are discouraging buyers. Considerable railroad bridge work remains under negotiation, but new work of this character is coming out slowly. The New England railroads, it is reported, do not expect to enter the market again this year for any more bridges. The minimum of the shape market now is 1.60c, Pittsburgh.

Shapes Held at 1.60c

Pittsburgh, Nov. 9. — The Carnegie Steel Co. and other manufacturers of structural shapes last week advanced prices to a 1.60c basis, or $2 a ton above the previously prevailing price. Shapes, at the opening of the year, were offered at 1.10c, or $10 a ton below the current price. Fabricating shops are enjoying activity and most of them are unable to obtain desired tonnages of structural material. No large structural contracts are reported in this district.

Shapes More Active

Chicago, Nov. 9.—Mills are practically out of the market on structural shapes and fabricators are having difficulty in filling their requirements. The same condition is true of car builders and at least one inquiry for a large number of cars has not been placed because of the difficulty experienced by builders in obtaining structural shapes and plates. The nominal quotation is 1.79c, Chicago mill, but no tonnage can be contracted for delivery short of eight months with western mills.

The American Bridge Co. has just closed with the Duluth & Iron Range Railroad Co. for 10,000 tons of structurals for ore dock No. 2 at Two Harbors, Minn., including aproaches, spouts, doors and fittings. This is the only large tonnage placed in the west recently.

Will Bid Soon

Indianapolis, Nov. 9.—Iron and steel works are preparing bids on the erection of 35,000 tons of steel that will be used by the Indianapolis Union Railway Co. in track elevation work in this city. It is expected that the contract will be awarded about the first of the year.

CONTRACTS AWARDED.

Duluth & Iron R. R. Co. ore dock No. 2, including approaches, ore spouts, doors and fittings, Two Harbors, Minn., 10,000 tons, to American Bridge Co.

Los Angeles County, Cal., highway bridge work, 630 tons, to American Bridge Co.

C. & N. W. Ry. Co., terminal grain elevator, Milwaukee, Wis., 405 tons to Worden-Allen and Milwaukee Bridge Co.

Pushmataha county, Oklahoma, highway bridges, 370 tons.

Minneapolis General Electric Co., building, Minneapolis, Minn., 240 tons, to Minneapolis Steel & Machinery Co.

Oklahoma State Capitol building, Oklahoma City, Okla., 215 tons, to Christopher & Simpson.

Bridge work for the Boston & Maine railroad, 1,500 tons, of which about 1,200 tons went to the Phoenix Bridge Co., a part to the Fort Pitt Bridge Works and the remainder to another independent shop.

Emerson apartment house, Baltimore, 700 tons, to Deitrich Bros.

CONTRACTS PENDING.

High school, Carbondale, Pa., 400 tons, bids being taken.

Telephone building, 175th street and Wadsworth avenue, New York City, 300 tons, bids being taken.

Bridge work for the Southern railroad, 500 tons, bids in.

Bridge work for the Lehigh Valley railroad, 600 to 700 tons, bids being taken.

Bridge work for the Central Railroad of New Jersey, 300 tons, bids being taken.

Office building for Consolidated Gas & Electric Co., Baltimore, approximately 4,000 tons, bids being taken.

Factory for Breyer Ice Cream Co., Philadelphia, 500 tons, bids being taken.

Central power and heating plant, Washington, bids to be taken next week by supervising architect, treasury department.

Bridges for Baltimore & Ohio railroad about 600 tons, bids in.

Bridges for Pennsylvania railroad, about 400 tons, bids in.

(For complete prices see page 964.)

Cast Iron Pipe

Not in Active Demand for Public Use—Chicago Prices Higher

New York, Nov. 9.—While no public lettings of any importance have featured the cast iron pipe market during the week, there is considerable interest by reason of several good-sized private tonnages. The largest single tonnage is for Cuba and involves approximately 4,000 tons of various sizes. Action upon this Cuban business is expected without delay. During the week, two lots aggregating 800 tons were sold for export to the Philippine Islands. Among private inquiries now pending is one from a buyer in this territory, involving about 2,000 tons, and one from a Chicago interest which is in the market for about the same tonnage. Prices continues to hold up firmly.

Cast Pipe Advances

Chicago, Nov. 9. — Although comparatively little business is being figured on by cast iron pipe makers a further advance of 50 cents per ton has been made in the Chicago district, 4-inch pipe being quoted at $29 and 6-inch and larger at $27, delivered, Chicago. This advance is due to the rapid increase in the cost of pig iron. Cities are refraining from putting forth their inquiries for next year's requirements and little is now under consideration. Routine business is fairly good and foundries are busy on old orders.

New Dock at Two Harbors

The Duluth & Iron Range railroad will expend $1,635,000 at Two Harbors in building a new concrete ore dock and remodeling dock No. 6. The new pier will be 80 feet high and will be equipped with 288 pockets arranged to handle four steamers simultaneously. The contract for 10,000 tons of steel for the dock has been let to the American Bridge Co.

Coke Shortage

Is Reported at Chicago—Market Quiet at Pittsburgh

Chicago, Nov. 9.—Severe shortage in foundry coke is being experienced in Chicago and vicinity. Most coke used here is from by-product ovens and every plant is worked at top speed, but demand is stronger than the possibility of supply. Some embarrassment is caused also by inability to obtain sufficient railroad cars at times and shipments are much interfered with.

As an illustration of the condition, one dealer has a contract for several hundred tons weekly for one consumer and recently shipments have been only 50 per cent of the contract, necessitating effort on the part of the consumer to obtain coke elsewhere when possible.

By-product foundry coke is now selling at $5.50, delivered, Chicago, and conditions seem to warrant an advance of 50 cents per ton shortly. Connellsville coke is quoted at $3 to $3.25, ovens, or $5.50 to $5.75, Chicago.

Connellsville Coke Quiet

Pittsburgh, Nov. 9. — The Republic Iron & Steel Co. and the Bethlehem Steel Co. have not figured in the market for spot Connellsville furnace coke this month. This has relieved the situation to a considerable extent, and, according to some dealers, the market is not so strong as it was a week ago. Most operators are holding spot furnace fuel at $2.75, ovens, and foundry coke is commanding $3 a ton, ovens, and above. The *Connellsville Courier* for the week ending Oct. 30, says production was 432,519 tons, an increase of 4,200 tons compared with the previous week. Merchant operators have 75 per cent of their ovens in operation and furnace interests are operating at about 81 per cent of capacity.

Virginia Coke Strong

Cincinnati, Nov. 9.—The coke market is very strong and prices are fluctuating over a wide range. Producers are changing quotations almost every day, and the general tendency is towards a higher level of prices. Furnace coke remains very scarce, and shipments of foundry grades on old contracts are exceptionally heavy. In some cases, foundries are taking additional lots in connection with the tonnages specified in their yearly contracts. The cheapest furnace coke available from southern fields is $2.60, ovens, but this price will probably be advanced to $2.75, ovens, before the end of the week. Foundry coke is being held at from $3 to $3.25, ovens, in the Wise county and Pocahontas districts, while the minimum quotation from the New River fields is $3.25, ovens. Furnace coke from New River ovens is being held at from $3 to $3.25, ovens.

Buying More Coke

Cleveland, Nov. 9.—Foundries finding that their melt is larger than they had estimated are coming into the market for additional tonnage of coke. Some important coke companies will not quote except upon submission of each individual case. On prompt foundry coke, prices range from $3.15 to $3.50, and on contract $3.25 is the usual quotation.

Higher at St. Louis

St. Louis, Nov. 8.—The coke market is looking up in this territory, and 72-hour Connellsville and Virginia foundry grades have advanced to $3 a ton at the ovens.

Spelter Higher

With Increased Foreign Demand—Copper Also Advances

New York, Nov. 9.—Prices on the various metals, generally, have registered considerable gains during the past week and this tendency is especially marked today. This improvement is noticeable particularly in copper, price on which, as a result of the considerably enlarged demand both at home and abroad, have advanced from ⅛c to ¼c. Most of the business now being booked is for shipment over the first quarter of next year and producers say they have very little more material available for this year's shipment. Electrolytic is quoted at 18.25c to 18.37½c, delivered 30 days. The best brands of casting copper are quoted at approximately 18c to 18.12½c, delivered 30 days, while ordinary casting copper is held at 17.62½c to 17.87½c, cash. The best brands of lake copper are quoted at 18.25c to 18.37½c, cash; ordinary lake at 18.12½c, and arsenical lake at 18c.

The American Smelting & Refining Co. late last week advanced its asking price on lead to 5c, New York. Apparently, this advance did not discourage buyers and the demand now is reported to be fairly active both for foreign and domestic consumers. Some independent producers are talking of asking a premium. The outside market is quoted at 5c, New York, and 4.92½c to 4.95c, St. Louis.

The spelter market, on a considerable volume of business, most of which has come from abroad, has advanced to 15.75c to 15.87½c, St. Louis, for prime western for spot shipment. November is quoted at 15.62½c to 15.75c; December at 15.37½c to 15.62½c; January at 14.50c to 14.75c, and the first quarter of next year at 14c to 14.25c. Brass special spelter may be quoted nominally at 16.12½c to 16.25c, St. Louis.

The antimony market is quiet, but extremely firm by reason of the scarcity of supplies. Spot Chinese and Japanese are quoted at 36c to 36.50c, duty paid. Nearby arrivals are quoted by some sellers at 33c, in bond, and by others at 34c, in bond. Domestic antimony is practically sold up and only limited quantities may be had from second sellers at around 35.50c to 36c.

Demand for aluminum is not so active and prices are somewhat easier. No. 1 ingot in carload lots may be quoted at 57c to 58c.

The tin market has been strong all week and prices have shown an upward tendency. Importers quote spot tin at 36.50c, but the metal may be obtained in some quarters at 36.37½c. November is quoted at 36.50c; December at 36c, and January, February and March at approximately 35.75c. There is a good demand in the market today, especially for requirements beyond Jan. 1.

(*For complete prices see page* 964.)

Ready for Orders

The Weimer Machine Works Co., Lebanon, Pa., whose erecting shop and pattern shop were burned recently, has accepted the offer kindly made by a local company for the use of its pattern shops and will put all its machinists to work in its undamaged machine shop. Not one man will be thrown out of work. With the exception of the largest work, the company will be in a position to make reasonable deliveries, as the smaller and medium sized tools were not damaged by the fire.

Started on Duplex Plant

Chicago, Nov. 9.—The Illinois Steel Co. has started work on the new duplexing plant at South Works, South Chicago, Ill. Improvements will be made in the bessemer plant and additional open hearth capacity will be provided, sufficient to handle the output of the bessemer converters. The purpose of this improvement is to make possible additions to the open hearth steel output and give elasticity by allowing tonnage to be converted into either form of steel.

W. B. Pollock Co., Youngstown, has taken an order for three ladle cars, to be shipped to Stockholm, Sweden.

Large Orders

Recently Placed by the Youngstown Sheet & Tube Co.

The following is a summary of recent purchases of machinery, etc., made by the Youngstown Sheet & Tube Co.:

It has purchased from the Baldwin Locomotive Works two 22 x 26-inch, 75-ton, 6-wheel standard gage switching locomotives.

The contract has been placed with the Nordberg Mfg. Co., of Milwaukee, for one 37 x 48 poppet valve uniflow engine for driving new 9-inch mill, and one 44 x 50 of same type for the 12-inch mill.

Extension of open-hearth buildings for three additional 100-ton furnaces has been placed with the American Bridge Co., and the Raymond Concrete Pile Co. has contract for piling in connection with the foundation work. United Engineering & Foundry Co. has the contract for 75 open-hearth charging cars. Wm. B. Pollock Co., of Youngstown, has the contract for six 260 cubic feet capacity cinder pots, and three standard cinder pot cars.

The contract for the coal handling plant in connection with the coke plant has been placed with Fairbanks-Morse & Co., of Chicago, and it is expected will be completed by the latter part of February.

Two gas booster blowers direct connected to Buckeye cross compound engines have been bought from the Connersville Blower Co., of Connersville, Ind.

Two coal breakers and four hammer mills have been bought from the Pennsylvania Crusher Co., of Philadelphia.

Three 768-horsepower sectional water tube boilers with superheaters for the new coke plant, boiler house No. 9, has been placed with Babcock & Wilcox Co. In connection with the coal handiing plant, one electrically operated car dumping machine has been bought from the Wellman-Seaver-Morgan Co., Cleveland.

Four cooling water pumps in connection with coke plant have been bought from Henry R. Worthington.

It recently has installed 12 barb wire machines, and 18 more are under contract. Humphrey & Sons are supplying these. In addition, two hoop nailing machines have been bought from the Morgan Machine Co.

Starting on New Sheet Mills

Chicago, Nov. 9. — The Illinois Improvement & Ballast Co. of Chicago has been awarded a contract at about $156,000 for the concrete foundation for the new mills of the American Sheet & Tin Plate Co. at Gary, Ind.

Work will be started immediately on foundations and other portions of the work will follow as rapidly as possible until the new $3,000,000 plant is ready for operation.

New Mining Building

The new mining building of the School of Mines, the Pennsylvania State College, was dedicated on Nov. 5. Dr. H. M. Chance, of Philadelphia, the speaker of the day, took as his subject "The Conservation of Mineral Resources". There was a large gathering of people, among whom were many prominent mining men from both the bituminous and anthracite fields.

The museum of the school, one of the best in the United States, is being installed in the new quarters, which, together with the added facilities for class room and laboratory work, will contribute materially to the increased usefulness of the school. The School of Mines was established in 1884 and has graduated a goodly number of men now prominent in the mining world both in Pennsylvania and other states.

Prices---Past and Present

With the prices of machine tools skyrocketing steadily, more than one interesting story has been told regarding "times as they used to be". In this connection comes an item from the Chicago district about a machine tool dealer who, for the sake of comparison, unearthed a price list dating back to 1893. This is what he found:

At the date mentioned a 14 x 5-inch lathe cost him about $152.50, today he is obliged to pay $450 for practically the same machine; a 24 x 8-inch lathe could be bought for $405, now he is fortunate if he can secure one at $1,425. The increase is approximately 300 per cent. There have been vital improvements to be sure, but not to such an extent as the prevailing temporary difference in price would indicate, discounting bonuses for delivery.

Forging Plant Sold

Indianapolis, Nov. 9.—A local court last week accepted a bid of $110,000 for the plant of the H. J. Martin Forging Co. in this city. The bid was offered by the Walker-Weiss Axle Co., of Flint, Mich. The local plant has been in the hands of a receiver for a year. The Walker-Weiss Axle Co. will operate the Indianapolis plant in connection with its works in Flint. Creditors of the bankrupt concern are expected to receive about 25 per cent of their claims.

The Aluminum Co. of America, Pittsburgh, is reported to be considering plans for the acquisition of properties of the Southern Aluminum Co. at Baden, N. C. The Southern company has been controlled by a number of French capitalists, who started a $10,000,000 plant a short time before the outbreak of the European war.

Slight Decrease

In Exports and Imports—War Demands Very Heavy

The statistical report of the bureau of foreign and domestic commerce for September shows that the exports declined about 24,000 tons, but the percentage is not large, as the exports for August were 405,850 tons and for September, 381,914 tons. For the nine months ending with September, the exports were more than double those for the nine months ending September, 1914.

IRON AND STEEL EXPORTS, GROSS TONS.

	September, 1915.	September, 1914.	Nine months, end'g September, 1915.	Nine months, end'g September, 1914.
Scrap	10,290	824	40,383	29,277
Pig iron	29,222	8,215	156,829	92,014
Billets, ingots, and blooms of steel	54,782	649	407,901	33,262
Wire rods	17,909	1,913	121,546	41,595
Steel rails	41,060	10,508	224,494	139,773
Steel bars	37,635	6,254	296,328	79,268
Iron bars	6,560	344	26,602	3,701
Struc. iron and steel	26,714	14,090	165,905	148,257
Hoop band and scroll	3,145	456	19,033	6,644
Sh'ts & plates	47,649	17,699	318,697	218,484
Tin and terne plates	22,271	4,726	105,107	44,783
Barbed wire	32,826	4,944	172,882	52,591
All oth. wire	21,659	4,294	168,060	53,620
Cut nails	648	102	3,134	3,050
Wire nails	9,558	2,079	66,545	21,428
All oth. nails, includ. tacks	938	349	6,179	2,106
Pipes & fit'gs	14,935	15,823	128,999	150,862
R. R. spikes	600	383	4,852	5,949
Bolts, nuts, rivets, washers	2,515	1,109	15,446	11,819
Horseshoes	671	1,309	13,972	2,048
Cast radiators	327	259	1,650	2,712
Total	381,914	96,329	2,464,544	1,143,243

IRON AND STEEL IMPORTS
Gross Tons

	September 1915	September 1914	Nine months ending September 1915	Nine months ending September 1914
Scrap	9,229	2,142	29,918	24,493
Pig iron	5,415	24,330	60,891	112,851
Ingots, blooms, billets of steel	855	3,124	9,271	32,755
Wire rods	614	150	3,870	5,641
Rails	6,273	7,342	60,646	18,682
Bar iron	813	609	6,595	12,643
Structural	49	396	1,202	8,484
Sheets and plates	66	235	924	3,355
Tin and terne plate	31	92	2,220	14,703
Totals	23,345	38,420	175,537	233,607

The exports continued heavy in products going into munitions and in munitions themselves. Tonnage imports and exports were as follows:

	Imports, gross tons.	Exports, gross tons.
January	10,569	139,788
February	7,505	144,363
March	8,025	174,311
April	16,564	223,236
May	28,917	262,306
June	32,201	355,396
July	20,858	378,890
August	27,556	405,850
September	23,345	381,914

Imports continue to be unimportant, September's total being only 23,345 tons.

Foundry Equipment Show

Will be Held at Cleveland Under Auspices of American Foundrymen's Association and Institute of Metals

As a result of several conferences, held recently at Cleveland and Pittsburgh, by the special committee empowered by the American Foundrymen's Association and the American Institute of Metals, to select the time and place for the 1916 foundrymen's convention, it has been decided to meet in Cleveland, during the week of Sept. 11.

At Atlantic City, the executive board of the American Foundrymen's Association authorized the appointment of a committee of five to decide upon next year's meeting place and this committee was instructed by the American Institute of Metals to serve also in its behalf.

The personnel of this committee is constituted as follows: R. A. Bull, Commonwealth Steel Co., Granite City, Ill., president of the American Foundrymen's Association, chairman; Jos. T. Spear, Pittsburgh Valve, Foundry & Construction Co., Pittsburgh, and Alfred E. Howell, Phillips & Buttorff Mfg. Co., Nashville, Tenn., past presidents; J. P. Pero, Missouri Malleable Iron Co., East St. Louis, Ill., senior vice president, and A. O. Backert, Cleveland, secretary, American Foundrymen's Association.

The annual exhibition of foundry equipment and supplies, to be held concurrently with the meetings of these organizations, will be conducted under the auspices of the American Foundrymen's Association and the American Institute of Metals. This decision was reached after mature deliberation and represents the unanimous action of the members of this special committee. It also has been approved heartily by J. S. Seaman, Seaman-Sleeth Co., Pittsburgh, past president of the American Foundrymen's Association, and Jesse L. Jones, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., president of the American Institute of Metals, with whom the members of the special committee met for counsel and advice.

Since the interests of the manufacturers of foundry equipment and supplies, who make exhibits at these annual shows, and the members of the American Foundrymen's Association and the American Institute of Metals are mutual, it is the sentiment of this special committee that the exhibitors should share in the profits to be paid in the form of rebates on the cost of their space. The exhibition will be held in the Cleveland Coliseum, on Thirteenth street in the center of Cleveland's business district. The Coliseum is within one block of the Hotel Statler, three blocks from the Hollenden and is only a short walking distance from the other Cleveland hotels. It contains 60,000 square feet of floor space on one level and is admirably adapted for a foundry show.

Sealed proposals have been invited from corporations and individuals capable of conducting exhibits, which are to be submitted to the secretary of this special committee, A. O. Backert, Twelfth and Chestnut streets, Cleveland, on or before 12 o'clock noon, eastern time, Saturday Nov. 13.

Will Soon Be Ready

Corrigan, McKinney & Co., expect to have at least a part of their new steel plant in operation the latter part of December. This plant will comprise eight open hearth furnaces as well as blooming mills. The company is now operating its old blast furnaces, which, with the new plant nearing completion, will comprise a battery of four furnaces. Officials of Corrigan, McKinney & Co. state that at no time in the last 18 months has the market been so satisfactory, and in their opinion this condition is not transitory, but reflects a condition of a lasting character.

First Issue of Bulletin

The Colorado Fuel & Iron Co. has issued the first number of an industrial bulletin which will be published monthly hereafter for the purpose of co-ordinating, harmonizing and furthering the social and industrial betterment work of the company, and also for purposes of informing the company's employes of the personnel and proceedings of conferences, boards and committees in which they are interested. It also is expected that the bulletin will form a record of events pertaining to social and industrial activity. The bulletin is handsomely printed, copiously illustrated and forms an exceedingly attractive publication. The first number contains 32 6 x 9-inch pages. An open letter from John D. Rockefeller Jr. to the employes of the Colorado Fuel & Iron Co. is published in four languages. The bulletin also contains a reprint of the text of the plan of representation of employes which will hereafter form the basis of the control of the relationship between the company and its employes.

Founders' Meeting

Will Be Held Next Week at Hotel Astor, New York City

The nineteenth annual convention of the National Founders' Association will be held at the Hotel Astor, New York City, Wednesday and Thursday, Nov. 17 and 18. Wednesday morning the reports of officers will be heard and addresses will be delivered by George F. Monaghan, general counsel of the National Founders' Association, and Magnus W. Alexander, chairman of the committee on safety and sanitation. After a buffet luncheon, there will be half-hour talks as follows: "The Equation of Co-operation", H. H. Rice, president National Metal Trades Association; "Industrial Preparedness", Col. George Pope, president National Association of Manufacturers; "The Limitation of Business Associations", John P. Wood, president National Association of Woolen Manufacturers; "Business Legislation", Albert G. Duncan, president National Association of Cotton Manufacturers.

The convention banquet will be held Wednesday evening with Hon. George F. Monaghan as toastmaster. Hon. Charles Nagel, St. Louis, will speak on "A Demand for a National Industrial Program", and Henry D. Estabrook, New York, on "Self Defense."

Thursday morning, there will be addresses as follows: "Our Foreign Trade: Its Possibilities", by W. S. Kies, vice president, National City Bank, New York City; "A New Era in Industrial Relations in the State of New York", by Louis Wiard, Wiard Plow Co., Batavia, N. Y.; "Shall Congress Regulate Production?" by James A. Emery, general counsel, National Council for Industrial Defense. Following these addresses, there will be open discussion, election of officers and miscellaneous business.

The annual alumni dinner will be held Tuesday evening, Nov. 16, and the administrative council will meet Tuesday morning at 10 o'clock.

The Ohio Society of Mechanical, Electrical and Steam Engineers will hold its next meeting at Zanesville, Nov. 18-19. Papers will be presented on "Advertising, Its Influence on Engineering", "Monel Metal", "Smokeless Boiler Design", "Steam Traps" and "A Heating System". Officers will be elected at this meeting.

MEN OF THE IRON TRADE

Who they are **Where they are** **What they are doing**

Henry Phipps is spending a few days at Pittsburgh, attending the annual chrysanthemum show in the institution which he presented Pittsburgh a number of years ago.

Thomas Tesseman has been appointed manager of the Youngstown Car Co., Youngstown. He formerly was identified with the Pressed Steel Car Co., Pittsburgh.

James A. Farrell, president of the United States Steel Corporation, visited offices of subsidiary companies and mills in the Pittsburgh district last week.

Andrew Carnegie will celebrate his eightieth birthday on Nov. 25. Recent reports that the iron master is not in the best of health are denied by his family.

Taylor Allderdice, vice president of the National Tube Co., Pittsburgh, has been appointed a member of the state board of education of Pennsylvania by Gov. Martin G. Brumbaugh.

E. F. Gold, who has been assistant contracting engineer of the McClintic-Marshall Co., at Philadelphia, has been made contracting engineer of the company at Columbus.

W. R. Haynie, manager of the United States branch of the Bolinders Co., with office at 30 Church street, New York, left on Nov. 6 for a six-weeks' trip to the home office and plant of the company, Stockholm, Sweden.

Henry D. Sharpe, treasurer of the Brown & Sharpe Mfg. Co., Providence, R. I., has given $1,000 toward a fund for a new home for the Providence Boys' Club, and also $100 to the military aeroplane fund of Rhode Island.

R. J. Kaylor, for the last two years a member of the editorial staff of the *Youngstown Telegram*, has been appointed publicity manager of the Youngstown Sheet & Tube Co., Youngstown, a recently created department.

Harry L. Davis, mayor-elect of Cleveland, is the son of the late Evan H. Davis, a puddler in the mills at Newburgh, and started his business life as an employe in the plant of the American Steel & Wire Co., Cleveland. He is 38 years old.

Edward T. Child temporarily has discontinued his duties as vice president of the Southwark Foundry & Machine Co., Philadelphia. Mr. Child has not recovered entirely from an operation for appendicitis performed last spring and will spend several months in rest and recuperation.

Michael W. Donahue, purchasing agent of the Wire Goods Co., Worcester, Mass., for 27 years an employe of the company, of which he is a stockholder, has resigned and accepted a similar position with the Morgan Spring Co., in the same city, where he began his duties Nov. 1. He was presented a mahogany mantle clock when he concluded his work Oct. 23.

P. J. McArdle, former president of the Amalgamated Association of Iron, Steel and Tin Workers, has been elected a member of the Pittsburgh council. Mr. McArdle served as a councilman of Pittsburgh four years ago. John Williams, present head of the Amalgamated Association, who also was a candidate for council, was defeated.

J. M. Milligan, connected with the Carnegie Steel Co. for 25 years, first at Homestead as chief time keeper and later as chief clerk at the Duquesne works, has resigned to join the Midvale Steel & Ordnance Co., Philadelphia, as auditor. A. C. Dinkey, former president of the Carnegie company, is president of the Midvale concern.

Albert Sauveur, professor of metallurgy and metallography of Harvard University, presented an illustrated lecture on "The Industrial Importance of Metallography" at the Exchange Club, Boston, Wednesday evening, Nov. 10, before the New England Foundrymen's Association. In the discussion which followed, representatives of prominent New England manufacturing plants and of the Watertown government arsenal participated.

Charles H. Stevens will address the regular meeting of the Brooklyn Engineers' Club, to be held at the Brooklyn Engineers' Clubhouse, 117 Remsen street, Brooklyn, on Thursday evening, Nov. 11. His paper will be devoted to "The Power Development of Brooklyn".

L. E. Yost has resigned as superintendent of the open hearth and blooming mill departments of the Upson Nut Co., Cleveland, to take up a similar position with the new plant of Corrigan, McKinney & Co. The resignation became effective on Nov. 1. Mr. Yost will be succeded by R. B. Bostwick, who is at present superintendent of open hearth department No. 3 of the Homestead works of the Carnegie Steel Co., Homestead, Pa.

Dr. John A. Brashear, president of the American Society of Mechanical Engineers, has been appointed a delegate to the Pan-American Scientific Congress, which will meet in Washington, D. C., Dec. 27 to Jan. 7.

D. R. Wilson, treasurer of the Carbon Steel Co., Pittsburgh, has been appointed assistant to the president, with headquarters at Pittsburgh. W. W. Noble, secretary of the company, has been elected assistant treasurer and W. L. Geddis has been made auditor in charge of the accounting and cost departments.

W. E. Moore, formerly general manager of the West Penn Traction Co., Pittsburgh, on Nov. 1 opened offices in the Union Bank building, that city, as a consulting engineer, specializing in building and equipping power plants.

The Westinghouse Electric & Mfg. Co. announces a number of changes in the supply department, which have recently been put into effect, as follows:

S. A. Chase, formerly special representative; T. J. Pace, formerly in charge of illuminating and rectifier divisions, and Carl G. Schluederberg, formerly head of switchboard sales, have been appointed assistants to the manager, J. J. Gibson.

C. E. Stephens, engineer of lighting, has been appointed manager of the illuminating section to succeed Mr. Pace. C. Streamer, formerly head of the order division, succeeds Mr. Schluederberg as manager of the switchboard section, and A. P. Joseph is appointed head of the order section to succeed Mr. Streamer. M. C. Morrow, formerly of the Philadelphia office, is appointed manager of the appliance section, which is a combination of the former heating, fan motor and ozonizer divisions of the supply department. M. C. Rypinski, formerly manager of the New York office, becomes manager of the meter section. The power department, E. H. Sniffin, manager, also announces the following section managers: W. H. Garrett, contracts; J. G. Worker, stokers, and H. D. Storer, auxiliaries.

Death of P. A. B. Widener

Peter A. B. Widener, capitalist, philanthropist and art collector, who climbed from the humble station of a butcher to that of a leader in the world of finance, died Nov. 6 at his home in Elkins Park, near Philadelphia. Mr. Widener was 80 years old and had been in poor health for three years. He was interested in railroads, had large blocks of United States Steel Corporation and Standard Oil Co. stock and had been a director of the Corporation for a number of years. Close friends estimate his wealth at about $35,000,000.

Served His Fellow Man

Henry Benjamin Smith, supervisor of safety and labor, Joliet Works, Illinois Steel Co., was born Oct. 6, 1862, in San Francisco, Cal., and died Nov. 7, 1915, at Joliet, Ill.

On account of the death of his father, followed closely by the death of his mother, Mr. Smith moved to Joliet to make his home with his uncle, Horace S. Smith, then general superintendent of the old Joliet Steel Co. He entered the service of the Joliet Steel Co. in 1878, and had a continuous service record since, with the exception of the period during the Spanish-American War, when he served his country as captain of a regiment of volunteers from Joliet.

Captain Smith was one of the first persons to take up safety work in the plants of the Illinois Steel Co., having been appointed safety inspector at Joliet Works in 1893, and continuing in the same capacity up to his death. His wonderful achievement in the cause of accident prevention and his untiring devotion in decreasing the suffering among his fellowmen will not soon be forgotten. He is survived by his widow and one son, Horace B. Smith.

Obituaries

Edward L. Gaylord, formerly president and superintendent of the Eagle Lock Co., Terryville, Conn., died at Bridgeport, Conn., on Nov. 2, aged 84 years. Mr. Gaylord had perfected a process for molding amber, from which he made various artistic designs. It is believed that he left no formula of the process.

Otis W. Everett, vice president, director and supervising manager of the Samuel Winslow Skate Mfg. Co., Worcester, Mass., one of the best known manufacturers in that city, was instantly killed there Nov. 4, by his automobile overturning and crushing him to death while returning from a trip to Boston. The auto was driven by his son, Lewis W. Everett, who escaped with a broken nose and severe body bruises.

George C. Whitney, president and treasurer of the George C. Whitney Co., Worcester, Mass., a widely known manufacturer, died at his home in that city, Nov. 7, after a long illness, due to a shock. He was a civil war veteran and prominently identified with the business interests of his home city. He was 73 years old.

Isaac Leonard Rice, who had been president of the Electric Boat Co., the Electric Storage Battery Co., the Electric Vehicle Co. and other corporations and who had become prominent as a promoter and inventor, died at his apartments at the Hotel Ansonia, New York, on Nov. 2, aged 64 years.

Will Advocate Advance

Traffic managers of steel companies in western Pennsylvania will appear before the interstate commerce commission at Washington, Nov. 12, to support the proposed rate of 55 cents on iron and steel commodities from Pittsburgh to Pacific coast terminals. That rate now obtains from Chicago. Transcontinental carriers say they are willing to extend the rate to Pittsburgh. Carriers, however, do not want to offer corresponding rates for short hauls.

Hearing on Slag

The public service commission of Pennsylvania is hearing testimony this week in Pittsburgh relating to proposed charges for hauling or wasting blast furnace and mill slag. Railroads some time ago filed tariffs providing charges ranging from 20 cents to 35 cents a ton for wasting slag, and these tariffs are in effect in Pennsylvania, Ohio and West Virginia. Some shippers, rather than pay for this service until pending cases are settled, are allowing bills to accumulate.

Electrical Engineers Meeting

Electric current collectors for locomotives, cars, ore bridges, cranes, including third rail systems, main and trolley collectors on cranes, etc., will be informally discussed at the regular monthly meeting of the Association of Iron and Steel Electrical Engineers, to be held Nov. 13 at the Seventh Avenue hotel, Pittsburgh. The simplex surface contact system will be discussed by D. W. Diehl.

Car Awards

Are Being Placed Freely—Many Inquiries Pending

New York, Nov. 10. (By wire.)—Further large lettings have been made in the car market and all indications are that activity will continue. The Central Railroad of New Jersey has ordered 1,000 hoppers each from the Pressed Steel Car Co. and the Standard Steel Car Co., while 1,000 box cars probably will go to the Standard company. The Pittsburgh & Lake Erie let another 1,000 hoppers to the Standard company. The Norfolk & Western let 1,000 gondolas to be built in its own shops. The Baltimore & Ohio let 1,000 additional hoppers to the Cambria Steel Co. The New York, Chicago & St. Louis let 300 hoppers. The Virginia Iron, Coal & Coke awarded 100 mine cars to the Pressed Steel Car Co. New inquiries for the Pennsylvania East include 1,000 to 2,000 gondolas, 1,000 to 5,000 hoppers, 40 to 50 coaches, 40 to 50 baggage cars. The Pennsylvania West inquires for 4,000 gondolas, 1,500 box cars, 60 coaches, mail baggage, etc. The Baltimore & Ohio inquires for 500 box car bodies. The Northern Pacific asks for 1,000 center construction cars, and the Interboro Rapid Transit 311 subway cars. The Burlington will buy 54 coaches, diners, etc., and the Virginian 250 box cars. Many more inquiries are pending.

The Union Pacific let 50,000 tons of rails to the Illinois Steel Co. The New York & Ontario Western is inquiring for 4,300 tons. Bids open in Paris Nov. 20 on 100,000 tons of rails for France. Russian inquiries are large, but indefinite. The Norfolk & Western has placed an additional tonnage, but no details are known.

Very Busy Plant

Rochester, Ind., Nov. 9.—The Rochester Bridge Co. is operating with a full shop force and now has enough business to keep the plant busy for the next three months. During the past month the company was awarded contracts for bridges valued at $70,000. A. L. Deniston, president of the company, says the price of raw material has advanced $10 since the first of the year but that the concern now is receiving a better price for its products. As a result of improvements in the plant 40 men are now doing the work which formerly required 60 men.

Fig. 1—Delinquent Truck of Box Car After Wreck, Showing Worn Spots and Flange Fractures

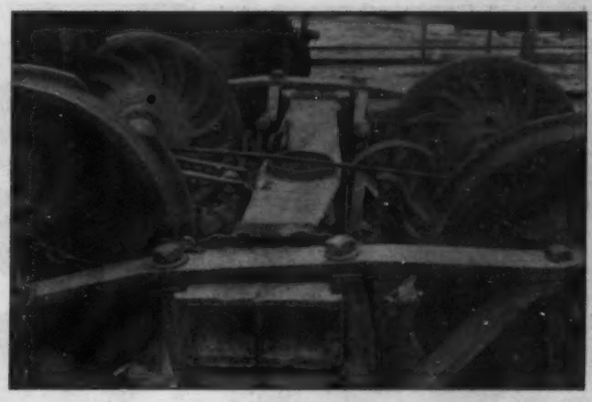


Fig. 2—Partial View of Box Car Truck After Removal From Place of Derailment

Wreck Due to a Faulty Car Wheel

STRANGELY parallel to the old story of "for want of a nail the shoe was lost", are the findings of the division of safety of the interstate commerce commission, in the case of a freight train derailment at Oakwood, Wis. Imperfect chills and careless inspection were the cause of the mishap, as determined by the commission.

DERAILMENT of a freight train on the Chicago, Milwaukee & St. Paul railway, at Oakwood, Wis., Feb. 9, 1915, caused 29 cars to leave the track. Eleven of these, with the station building, were destroyed by fire. The division on which this accident occurred is a double-track line, trains being operated under the automatic block-signal system. Approaching the point of derailment from the east the track is straight, with a slight descending grade. The train involved in this accident was a westbound freight, consisting of 75 cars and a caboose.

Examination of the track showed that the first indication of anything wrong was at a point about one mile east of Oakwood, where an oil box, brass, packing waste, etc., were found on the east side of the track. About 370 feet west of this point the rear truck under a box car, the tenth car in the train left the rails and ran along on the ties until the frog at the house track was reached, where the rest of the cars in the train were derailed.

The oil box, etc., were found to have come from the rear truck of the box car, partial destruction of the truck at this point evidently having been due to the defective condition of the wheels under the truck. Three of the four wheels were defective, the left forward wheel, being the only one intact. The others had flat spots, broken flanges, etc. Investigation developed that this car was received at Chicago in a transfer train. Before the train was broken up and switched around, all the cars in the train were inspected and, although wheel defects were found in other cars, none was found under this car. It was again inspected by two car inspectors, one safety-appliance man, and two oilers before being sent out, no defects being discovered. The engineman stated that as his train was approaching Oakwood he looked back and noticed fire flying from under the train, and at once applied the air brakes, at about which time the derailment occurred. Previous to this he did not notice anything wrong. At Wadsworth, 30 miles east of Oakwood, the train was inspected by the brakemen, but nothing wrong was discovered at that time.

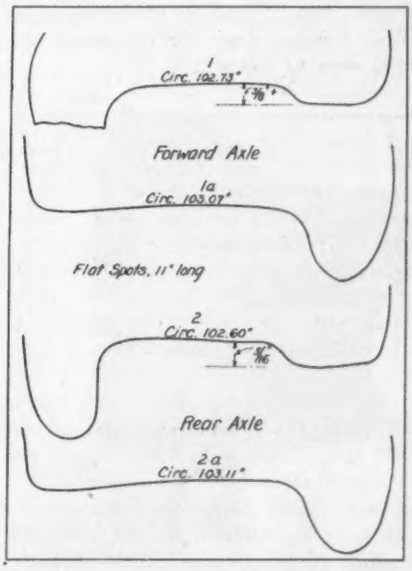


FIG. 3—CONTOURS OF EACH OF THE FOUR WHEELS OF THE FAULTY TRUCK, SHOWING FLANGE WEAR AND GROOVES WORN IN TREADS OF NOS. 1 AND 2. THESE TWO WHEELS WERE THREE AND FOUR "TAPE SIZES" SMALLER, RESPECTIVELY, THAN THEIR MATES, NOS. 1a AND 2a

The examination to determine the reason for the failure of the wheels under this car was conducted by James E. Howard, engineer physicist, tests being made in conjunction with representatives of the Chicago, Milwaukee & St. Paul railway at the shops of that company in Milwaukee, Wis. His report covering the results of this investigation is, in part, as follows:

The chilled-iron wheels in use under the box car, which caused the derailment at Oakwood, were 33-inch wheels. The wheels on the right side were designated as Nos. 1 and 2, those on the left as Nos. 1a and 2a. Each of the right-hand wheels had deep flat spots worn on its tread, with parts of its flange broken off at places circumferentially immediately to the rear thereof. The flange of the left-hand wheel of the second axle was broken at a place one-quarter of the circumference back of the break in the flange of its mate. The forward left-hand wheel was intact, the only uninjured one in the truck. Figs. 1 and 2 show the truck as it appeared after its removal from the place of derailment and transfer to the yard at Milwaukee. It received considerable injury on the occasion of the derailment. The oil box of the rear

Excerpts from a report submitted to the interstate commerce commission by H. W. Belnap, chief of the division of safety.

axle, right-hand side, was gone, bolt heads were sheared off, and parts of the frame distorted, occurring in part probably after the wheels had left the rails. The destruction of the oil box, it is believed, was brought about by the condition of the rim of the wheel, and was an event which immediately preceded the derailment. At each rotation of the wheel the axle must have wabbled a very considerable amount, as the subsequent examination showed. This was the case with both right-hand journals of the truck, due to the eccentricity of the treads of the wheels at those ends.

The flat spots on wheels Nos. 1 and 2 were 3/16-inch and 1/8-deep, respectively, measured from the shoulders of the outer parts of the treads, and each was 11 inches long. In width these spots formed grooves somewhat wider than the head of a 100-pound rail, the inner edges of which coincided with the flanges of the wheels. The endwise drift of each axle was toward the right, which resulted in flange wear of the right-hand wheels, with the absence of such wear on the opposite ends. The endwise drift of the axles and shoulders at the flat spots of the wheels appear cogent reasons for the occurrence of the broken flanges at the particular places where they were found, while the wabbling of the journals sufficiently accounts for the general destructive effect witnessed in the truck.

Measure Treads in Lathe

In the examination of the wheels the radii of the treads were measured when the axles were mounted on dead centers in a lathe. The journals of both axles ran nearly true, the conditions attending the derailment not having sprung them materially. The radii of wheels Nos. 1 and 2, measured in a plane 3 inches from the outside of the rim, were as follows:

Station.	Radii. No. 1 Inches.	No. 2 Inches.
1	16.04	16.10
2	16.27	16.25
3	16.30	16.37
4	16.31	16.37
5	16.31	16.37
6	16.31	16.35
7	16.35	16.35
8	16.37	16.35
9	16.37	16.34
10	16.39	16.35
11	16.40	16.34
12	16.40	16.32
13	16.40	16.30
14	16.38	16.30

The maximum variation in the radius of wheel No. 1 was 0.36 inch; in that of No. 2 it was 0.27 inch. The shoulder abreast the worn spot of No. 2 was a little above the circumference of a circle described by the maximum radius in the plane of these measurements. The mates of these two wheels ran fairly true on their treads, while the flanges of all four wheels ran well.

Two unsatisfactory conditions pertained to the wheels of this truck, first, the flat spots which caused a variation in radius, as above shown, and second, differences in the peripheral lengths of the mated wheels. With each rotation there was a vertical movement of the right-hand journal, and, due to the difference in circumferences of the wheels on the same axle, one had a tendency to travel over a different length of rail than the other. The vertical travel of journal No. 1 per mile of track would aggregate about 18 feet; that of No. 2 nearly 13 feet, with oscillations for train speeds of 25 miles per hour occurring at a rate somewhat above four per second of time. The circumference of the four wheels and the differences of those on the same axle were as follows:

Number of wheels.	Circumference. Inches.	Difference. Inch.
1	102.73	
1a	103.07	0.34
2	102.60	
2a	103.11	0.51

These differences are seen to be substantially three and four "tape sizes," respectively. Per mile of track the larger wheels of the mates would tend to travel the greater distances of 17.4 and 26.1 feet, respectively. The distance this car was hauled from Galewood yard to the place of derailment, 70.7 miles, would therefore call for aggregate differences approximating one-fourth of a mile and one-third of a mile for the two axles. Such were the conditions which prevailed at the time of derailment. The wheels were not serviceable, and their appearance indicated that a considerable interval of time had elapsed since they had been.

The inquiry was conducted to ascertain the physical state of the metal of the wheels in respect to depth of chill and hardness of the treads. Questions of strength did not enter as a factor, the manner of failure being such as to exclude strength as a direct considera-

FIG. 5 — RIM OF CHILLED WHEEL, SHOWING THERMAL CRACKS AT THROAT AND FLANGE. FRAGMENT MADE IN A DROP-TESTING MACHINE, FROM A WHEEL WHICH BROKE IN SERVICE, CAUSING A DERAILMENT. LARGE AND SMALL FRAGMENTS SEPARATED

FIG. 4—SECTIONAL VIEW OF RIM OF WHEEL NO. 1, SHOWING CLEARLY THE LIMITED DEPTH OF CHILL. THIS FRAGMENT OF WHEEL WAS PICKED UP AFTER RUPTURE MADE AT THE FOUNDRY BREAKER

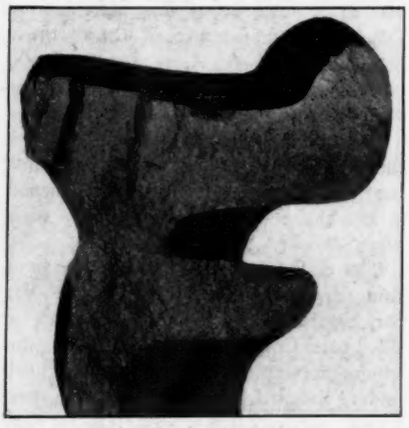


FIG. 6—SECTIONAL VIEW OF RIM OF WHEEL NO. 1a, SHOWING GREATER DEPTH OF CHILL THAN ITS MATE, NO. 1. FRAGMENT OF WHEEL AFTER RUPTURE MADE AT THE FOUNDRY BREAKER

FIG. 7—VIEW OF TREAD OF CHILLED WHEEL, SHOWN IN SECTION IN FIG. 5. THERMAL CRACKS AT THROAT, IN AREA OF MAGNETIC OXIDE ON THE SURFACE OF TREAD. LARGE AND SMALL FRAGMENTS ASSEMBLED

tion. The flanges of three of the wheels were broken, fragments being detached in detail. These were secondary matters, it is believed, induced by the flattened and grooved treads.

Examine Fractures

The wheels were pressed off the axles, after which they were taken to the foundry breaker, broken, and the fractures examined. The force required to remove the wheels from their axles ranged from 50 to 60 tons. The diameters at the wheel fits were 5¾ by 7 inches long. Although the wheels were firmly attached to their axles, the latter were rusty over parts of their length, indicating irregular boring or turning, with places where the axles did not fill the hubs of the wheels. In the hub of wheel No. 1a the axle was rusty for the greater part of its length, indicating a short length of fitted surface.

The fragments of the wheels showed a limited depth of chill, excepting wheel No. 1a. There was practically no chilled metal below the worn spots of the treads of wheels Nos. 1 and 2. Some chilled iron remained in other parts of the treads. It ranged from ⅛-inch at the throat to ¾-inch at the corner of the rim in wheel No. 1. In wheel No. 2 the chill at the middle of the width of the tread, 21 inches circumferentially from the worn spot, was ⅛-inch. On the left-hand ends of the axles, wheel No. 1a had a depth of chill of ⅝ to 1 inch. In No. 2a it ranged from ½ to ⅜-inch at the corners and about ⅛-inch in other parts of the tread. The flat-worn wheels and one of the mates clearly had "soft" chills, to which circumstances the worn spots are in the main attributed.

Figs. 4 and 6 show the appearance of fractured portions of the rims in cross sections of wheels Nos. 1 and 1a. These views show fragments made at the foundry breaker.

The chemical analyses of the metal of three of the wheels, furnished by the Chicago, Milwaukee & St. Paul railway company, were as follows:

Wheel.	Phosphorus.	Manganese.	Sulphur.	Silicon.
1	0.351	0.65	0.207	0.73
2	0.324	0.63	0.228	0.71
1a	0.350	0.68	0.205	0.72

The contours of the four wheels are shown in Fig. 3, in which are also entered the circumferences of each and depths to which the right-hand wheels were locally worn. Measured radially, the amounts the two right-hand wheels ran out differ slightly from the depths locally worn on the treads. This result comes about from the shoulder not having the same radius as the comparison portion of the tread in the plane of the flat spot.

Lacked Sufficient Chill

There was no evidence of thermal cracks in these wheels, nor were there indications present of their having been exposed to a high temperature during their term in service. The wheels were worn flat, as it appeared, by reason of the softness of the metal of the treads—the absence of chilled metal. If the "tape size" of a chilled wheel is a reliable index of the depth of the chill, then it would follow that usual inspection measurements, if made, must have shown the softness of these wheels. Therefore the period of their manufacture is believed to be accountable for their physical condition, while the responsibility for their continued use should be shared jointly by the different car inspectors through whose hands the car passed after the wheels had reached an unserviceable state.

FIG. 8 — VIEW OF RIM OF SAME CHILLED WHEEL AS SHOWN IN FIGS. 5 AND 7, SHOWING DEPTH OF CHILL RANGING FROM 1 INCH TO 1¼ INCHES. SMALL THERMAL CRACK NEAR OUTER EDGE OF RIM. FRAGMENT MADE IN THE DROP-TESTING MACHINE

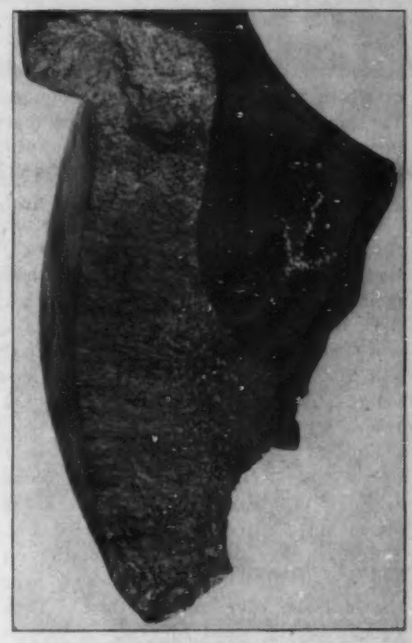


FIG. 9—OPPOSITE END OF FRAGMENT OF CHILLED WHEEL SHOWN IN FIG. 8, SHOWING A SUCCESSION OF SHORT THERMAL CRACKS IN TREAD NEAR OUTER EDGE OF THE RIM

Examine Various Wheels

For comparative purposes other chilled wheels were examined, some of which had been exposed to exceptional conditions and had failed in service, while others had been removed on account of vertical flanges, "shell outs," and comby treads. In Fig. 5 are shown two fragments, a large and a small one, from a wheel which fractured in service, at which time about one-third of the rim was detached. The wheel displayed evidence of having acquired a comparatively high temperature through brake action, its fracture being due without doubt to that cause. These particular fragments were made in a drop-testing machine during the examination of the general state of the metal. Fig. 5 shows a sectional end view of the two fragments. There was a small thermal crack at the throat and a larger one separating the metal of the flange. The smaller one was oblique in direction, while the flange break was direct across the rim. There was a group of small cracks in the vicinity of the throat within an area partially

covered by the magnetic oxide of iron. Other areas of magnetic oxide were present on different parts of the tread, in which thermal cracks were common. The presence of this oxide signified that the surface of the tread had been exposed to a comparatively high temperature.

Differences in depth of the color of the thermal cracks illustrated in Fig. 5, leads to the inference that they had their origins at different periods, that the formation of the throat crack was antecedent to that of the flange, and that the latter was probably developed on the occasion of the final fracture of the wheel.

Figs. 8 and 9 show the opposite ends of another fragment of the same wheel. A small thermal crack is shown on the fractured surface of Fig. 8 and a succession of short cracks on Fig. 9, all of which were located near the outside edge of the rim. They penetrated the tread for varying depths, from ⅛ to 5/16-inch, each taking a general course crosswise the rim. In the vicinity of these cracks the surface of the tread presented a fine pebbled appearance, resembling the surface acquired at the bore of a gun after firing a number of rounds and consequent exposure to the high temperature of the powder gases.

In respect to the period of formation of cracks in the tread and those of the plates, it is believed that they are not of simultaneous occurrence, but that plate fractures have their period of development at the time of maximum temperature of the rim; that is, when the difference in temperature between the rim and the plate is greatest. The rim at this time would be in compression while the plates were then in tension.

Thermal Cracks Caused by Tension

Thermal cracks in the tread, as well as those in the plates, are tension fractures. Their formation in the tread would be expected to occur when the immediate surface of the tread was rapidly cooled, after a period of heating and while the interior metal of the rim was still hot, in this manner reversing for the time the strains at the immediate surface and leading to the development of tension fractures. The surface of the tread is subjected to a sudden lowering in temperature in passing from contact with a heated brake shoe to the running surface of a cold rail. Air cooling of the surface of the tread would also be expected to aid the formation of thermal cracks.

The critical period in the formation of cracks in the plates would coincide with the time when the brakes were acting, while that of incipient thermal cracks in the tread would be found in the interval immediately succeeding the release of the brakes. The extension of thermal cracks in the tread, according to this analysis, would be progressive. After incipient cracks had once formed in the tread the sudden heating of a cold wheel, through brake-shoe pressures, would, however, introduce conditions tending toward their future extension, thus constituting a difference between the starting of a crack in this part of the wheel and its subsequent extension.

These disruptive influences are inseparably connected with the service requirements of a wheel, and they explain why wheels exposed to severe service conditions are those which are most likely to fail. Braking conditions are prominent factors in the case as experience continues to show.

FIG. 10—CROSS-SECTION OF RIM OF CHILLED WHEEL. FRAGMENT FROM A SCRAPPED WHEEL, BROKEN AT A FOUNDRY BREAKER SHOWING A THERMAL CRACK IN THE TREAD MEASURING 1¼ INCHES LONG BY ¾-INCH DEEP. DEPTH OF CHILL, MINIMUM, ½-INCH

The depth of chill in the wheel represented in Figs. 5, 7, 8 and 9, ranged from 1 to 1¼ inches. Below the white chilled iron was about 1¼ inches of mottled iron, beyond which gray iron was met. Some parts of the ribs of the wheel were white iron. The hub and plates were gray, excepting in the vicinity of the chaplets and core anchors, where, as not infrequently is noted to be the case, the metal was white.

The chemical analysis of the iron was as given in the following analysis:

	Per cent.
Carbon, total	3.50
Phosphorus	0.35
Manganese	0.39
Sulphur	0.155
Silicon	0.41

The appearance of the fractured surface of another wheel is shown in Fig. 10, an endwise view of the rim. The thermal crack near the outer edge of the rim measured 1½ inches long by ¾-inch deep and was located in a plane extending across the tread. The minimum depth of chill was about ½-inch, with 1 inch of mottled iron between the white and the gray iron. This fragment came from a wheel selected at a foundry breaker.

Incipient cracks in materials which are the result of service conditions cannot be regarded as undeserving of attention. Nevertheless, it must be recognized that there are probably many wheels of this type in service in which thermal cracks are present which have been caused by severe braking conditions. The possibility of their extension and development into a dangerous state is an important feature to be considered. The use of material which furnishes evidence of being overworked calls for the exercise of a discriminating judgment, presenting the alternative queries when to continue its use and when to recommend its rejection from service. Causes which are found to be common to derailments should be given earnest consideration.

Worn Wheels a Menace

In conclusion, the immediate responsibility for this derailment is fixed on the worn treads of two of the wheels. These flat spots were not "slid flat" places, but were grooves 11 inches long each, worn in the treads, and having depths of ⅜ and 5/16-inch, respectively. The grooves were wider than the head of a 100-pound rail. The axles drifted to the right, in the direction of these wheels, which showed worn flanges, approaching vertical faces. The examination also revealed the fact that these wheels had less depth of chill than customary in wheels of this type, and at the worn spots the chilled metal was entirely absent.

The lack of rotundity of the wheels was such that excessive wabbling of journals occurred at every rotation, bringing undue strains on the truck frame. At usual speeds these oscillations took place several times a second, and they are believed to have been the cause of the injury to the truck and the immediate forerunner of the derailment. Furthermore, the mated wheels were of different sizes. Those on the

(*Continued on Page* 964b.)

Electrical Practice in Steel Mills

INTERESTINGLY discussing a phase of the steel industry which is only on the threshold of its development, Mr. Petty delineates the various steps by which electrical equipment, through its flexibility, economy, ease of adjustment, and other attributes, became indispensable. He also discusses the controlling of mill motors.

By D. M. Petty

A STUDY of the evolution of electrical departments in steel mills will show that they originated in the small force required to operate an arc light machine. The next step was nearly always an enlargement made necessary by the addition of a constant voltage direct current generator to furnish current for cranes and similar apparatus. Later, motor applications increased with remarkable rapidity, until today statistics show that there is well over 1,500,000 horsepower in motors installed in the iron and steel industry. Further study of this development will show its cause has been the ability of the motor to reduce cost of manufacture. Two of the greatest factors entering into this reduction of cost have been increased production and improvement in quality. These two factors then should be the chief aims of the steel mill electrical engineer. To these two major items can be added comfort of the operators and appearance of the mills, both of which add to the efficiency of the plant.

Indirectly, the electrical engineer has aided in cost reduction by adding flexibility to the layout of the plant, by making possible the concentration of prime movers, and by reducing the losses of power transmission. To attempt to discuss even generally all these factors would be indeed a great undertaking and no such attempt is made here. The three topics presented play their small part in helping to make a plant more efficient and therefore can rightfully claim the attention of the electrical engineer.

Much has been said before the engineering societies and more written for the technical press about individual, group and line-shaft drive for machine shops. All three systems have their fields. The first two are more universal than the last one and the first seems to be growing in favor. It is not difficult to define the ideal conditions under which each should be used. If a large number of machines are turning out one particular kind of work and the operation performed on one machine is a sequence to that performed on another, so that to produce at a constant rate all machines must be running at the same time, line-shaft drive will prove very satisfactory. But the losses are evident if this entire shaft laid out to drive many machines must run when only a few are wanted. The group drive is but a refinement of the line-shaft drive and its flexibility is in direct proportion to the number of groups that go to make up the shop.

Individual drive finds its most inviting field in a shop doing a variety of work, on machines not dependent upon one another. The economic value of the individual drive is sometimes hard to reduce to dollars and cents. However, when the extra work done by a machine always working at its most efficient speed is compared to the additional cost plus the loss in production due to fixed speed with line-shaft or group drive, the balance is usually in favor of individual drive. In addition to the increased efficiency of motor-driven machines, they also possess the advantage of being able to operate in any part of the shop, and can therefore be located to reduce handling of work. Individual drive also means more head room, more efficient crane service, better light, reduced hazards to the workmen and improved general appearance of the shop.

Requires Adjustable Speed Motor

To obtain maximum efficiency from individual drive, an adjustable speed motor must be used. Direct current shunt wound motors are to date the most satisfactory of this type and the speed adjustment is obtained by varying the strength of the field. A few years ago the operator was depended upon to properly adjust the speed of the motor as well as to start and stop it. A drum-type controller performed this function fairly well, provided the operator was careful. But the desire of the operator to increase production caused him to start the motor too quickly as well as attempt to stop it in the same way. Quick starting overloaded the motor, causing it to spark, which rapidly reduced the commutator, brushes and controller to an inoperative condition. Quick stopping caused, in addition to the overload, a high voltage across the armature due to suddenly increasing the field from a weak to a strong condition, which caused the armature insulation to break down; and a ground occurred which put the armature out of commission. All these troubles caused delays and meant loss of production as well as increased cost of repairs. It therefore became necessary to improve not only the motors, but the controllers as well. These improved controllers naturally were not perfect in the beginning, but have now reached the point where they not only protect the motor, but increase its working ability. To show how this is accomplished, comparative tests were made on duplicate engine lathes doing the same work and driven by duplicate motors, the difference being an automatic controller in one case and a drum-type controller in the other. The conclusions to be drawn from these tests are:

First, the automatic controller protects the motor, not only from excessive currents in starting, but excessive voltages in stopping. Second, it decreases the starting and stopping time, which will amount to a considerable item when the operation requires frequent stopping. The possible exception to these conclusions would be that a drum-type controller might equal the automatic on applications using speed adjustments of one to 1½ or under. Although the above tests were made on lathes, the results apply to practically all rotary machine tools.

Another general type of machine tool is exemplified in the reversing planer. Here the automatic controller and adjustable speed motor are making great strides. In this case, of course, it is necessary to consider only the automatic controller. The reversing motor drive has proven to be a much faster and more flexible method of driving a planer than any of the belt shifting or clutch systems. It is also more accurate in stopping, that is, it comes nearer stopping at the same place at each stroke, with a given setting of the reversing gear.

For the reversing motor drive there are two fundamentally different control systems in use today. One stops

From a paper read at the ninth annual convention of the Association of Iron and Steel Electrical Engineers, Detroit, Sept. 8 to 11, 1915.

by applying reverse power, either with or without the help of a friction brake. The other stops by dynamic braking on the motor before the reverse power is applied. Both systems have advantages and each particular application must be studied very carefully in order to arrive at the best solution. The fact that both systems are in successful operation shows that the difference in results is not great. The advocates of either system, however have equal assurance that theirs is the best.

Those systems that depend purely on dynamic braking for stopping have one weak point, namely: If voltage fails at or near the end of a stroke the drift of the planer bed may be much more than normal. If the clearance is short this overtravel will wreck the machine and in certain cases spoil the work. The systems which depend on reverse power for stopping usually employ a friction brake attached to the armature shaft which sets upon failure of voltage. If this brake is powerful enough to stop the motor within reasonable limits no damage will be done. Mistakes have been made in using a brake too small and damage has been done on account of excessive overtravel. To perfect this system in this respect the brake should be made strong enough to stop the motor in exactly the same number of revolutions it would stop in if reverse power was applied. If this is done, and the brake arranged to set upon failure of the reversing switches to close, the system is comparatively safe.

Reverse System a Time-Saver

With the same table speeds and length of stroke the reverse power system will gain a little time on each reverse over the dynamic braking system. On short strokes which mean frequent reversals this may easily amount to an appreciable item in production. With varying loads caused by variable rates of feed, toughness of metal, etc., the dynamic stopping system will be more accurate in stopping than the reverse power system. This weakness, however, in the latter system can be almost eliminated by allowing the brake to set momentarily on every reversal. The objection to this is the wear on the brake which, unless very liberally designed may need frequent adjustments, resulting in considerable added expense.

Regardless of the system under consideration, one of the most vital points in the control is the master switch, which is operated by the reversing gear. It must be rugged to stand the shock of the dog striking the reversing gear on the rapid return stroke. It must be positive in action; that is, it must never fail to stay reversed when thrown from one position to the other.

The possibilities of reversing motor drive are great and the steel mill engineer cannot afford to neglect the opportunities it offers. The present standard range of speeds for planers is four to one, but six to one can be used to good advantage on long stroke work and even greater ranges of speed may be used in the future.

Recovering Aluminum Chips by Melting

By H. W. Gillett

IF A foundryman attempts to melt down the No. 12 alloy chips made in machining aluminum castings for automobiles in the same way he would melt brass chips, either by adding them in small amounts to a pot of metal, or melting them alone, he usually recovers somewhere between 50 and 70 per cent of the chips in a pool of metal in the bottom of the pot and loses from 30 to 50 per cent in a light fluffy dross that, as soon as the air strikes it, gets excessively hot, glows with a blinding light and smells of ammonia when moistened.

One naturally supposes that the cause of this dross formation is the great affinity of aluminum for oxygen and that the dross comes from oxidizing conditions within the furnace. Foundrymen frequently are told that to melt aluminum borings one should get a pot half full of molten metal and then stir the borings in so as to cover them with metal and keep the air away from them, finally fluxing with sal-ammoniac or zinc chloride. The trouble is that the borings prefer to stay on the surface and refuse to be stirred in. If the borings, as is usually the case, are contaminated with even 2 or 3 per cent of fine dirt, such as floor sweepings, one can melt in a closed retort, or in an electric furnace in the entire absence of oxygen, and still get very low recoveries and copious amounts of dross.

Where the Trouble Lies

The real trouble lies in the fact that a large proportion of the chips are only about 0.005-inch thick, and will pass a 20-mesh riddle. When such a chip melts it forms a globule of metal about as big as a pin point. Each chip has had an infinitesimally thin film of oxide on it, formed the moment it was cut. That such thin films prevent metallic contact between aluminum surfaces is plain from the fact that a bundle of aluminum wires may be twisted together and brought up to the fusion point without welding together at all unless they are forced together so that the film is ruptured or unless a flux that will dissolve aluminum oxide is used.

Each little pin-point globule is then surrounded by a film of oxide, infinitesimal in thickness or weight, but yet sufficient to keep the globules from uniting. If any fine dirt is present, this reinforces the oxide armor and makes the trouble worse. So our dross, instead of being mainly aluminum oxide, is mainly tiny globules, separated by films of oxide and dirt. Were this not the case, and were the dross all oxide, it would not get hotter on striking the air when skimmed off. Thus, while the cold dross is oxide, the hot dross is an emulsion of metal droplets kept separate by a solid honey-comb-like structure of oxide and dirt.

The problem is then, mainly one of getting these tiny droplets to coalesce and to free themselves from the dross. The common method is to stir sal-ammoniac or zinc chloride into the dross. These fluxes, so-called, are really mainly stirrers. They gasify at temperatures below the melting point of aluminum and the violent evolution of gas tosses the mass of dross about, throws some of the globules together with such force that the enveloping film is ruptured and a few of the globules coalesce. But the volatile fluxes are not efficient stirrers and the dross, after they are used, still burns up in the air almost like a flash-light powder, because of the metallic aluminum still left in it.

It is, of course, desirable to melt in a reducing atmosphere, if possible, but oxidation within the furnace is far less troublesome and far more

A paper presented at the Atlantic City meeting of the American Institute of Metals, Sept. 28-30, 1915. The author, H. W. Gillett is associated with the bureau of mines and this paper is published by permission of the director of the bureau.

readily overcome than the reluctance of the aluminum globules to coalesce. Many methods of melting chips have been suggested, ranging from the use of vacuum furnaces to that of patent fluxes with enticing names at 25 cents per pound. Two methods, both of which aim to promote coalescence, are in use by two firms refining aluminum chips on a large scale, and give good results.

The first of these is the "puddling process". The melting is done in oil-fired furnaces, using iron pots, the furnaces being provided with close fitting hoods. The empty pot is heated up to a low red, and a few shovels of chips are put in. The furnace tender stands by with a big skimmer and works the chips over constantly till they start to get pasty. Before they are fully melted, he adds another small dose of chips and works them into the dough-like mass. The mass is not allowed to get visibly red. The addition and the working over of the chips is continued until the pot is full, holding the temperature practically at the melting point. By the constant stirring of the pasty mass, the tiny globules are pressed together, and the films of oxide and dross broken through, so that the result is a uniform pasty mass of metal, enveloping particles of dirt and oxide instead of a little molten metal below and a mass of dirt and oxide enveloping globules above. The pot is then covered and the metal heated to about 700 degrees Cent. or 1,300 degrees Fahr., until the dirt and dross rise.

Zinc chloride is then stirred into the risen dross, which is skimmed rapidly into water so as to stop oxidation and allow the recovery of entrained metal.

This method gives about 70 per cent recovery on the ordinary dirty borings of commerce. On borings cut with a water-soluble cutting compound, if the wet borings are allowed to dry out in the air, to oxidize and cake up, the recovery by this method is 50 to 60 per cent. But if these borings are very carefully kept free from dirt and are promptly dried, after cutting, by a centrifugal process, these clean, dry borings give 85 to 90 per cent recovery by this process.

The puddling process requires the constant attention of the furnace tender, and the daily output per man is small.

The other process is based on the same principle as that of welding aluminum, where fluxes composed of chlorides and fluorides of the alkalies or alkaline earths are used to dissolve the film of aluminum oxide and to allow the metal surfaces to unite, fluorides being the best known solvents for aluminum oxide as well as good ones for siliceous dirt. The chips are intimately mixed before charging with large amounts, 20 to 50 per cent of the weight of the chips, depending on their degree of cleanliness, of a flux consisting of about 85 per cent common salt and 15 per cent powdered fluorspar. The mixture of chips and flux is put into large crucibles, heated in a coke fire. As soon as the chips start to melt, they are jammed down to make room for more mixture, until the pot is full.

The pot is then left undisturbed without stirring, until the flux is fully melted, and fluid enough to absorb the oxide and dirt either by true solution, or by soaking it up mechanically, the tiny metallic globules falling through and collecting in a molten mass. This requires at least 900 degrees Cent. or 1,650 degrees Fahr. On absolutely clean borings, this method gives 90 to 95 per cent recovery, while chips very foul with dirt may give but 65 per cent. This method cannot be used in iron pots because the temperatures required are too high for reasonable pot life. It will probably require more fuel than the puddling method because of the higher temperatures and because so much flux must be heated up. The flux, although it has to be used in large amounts, is so cheap that it is hardly more expensive than the zinc chloride used in the puddling method. The crucible expense will be a little higher than that for iron pots in the puddling method, but the labor cost should be very much lower.

Moreover, it is quite possible that by increasing the amount of flux to correspond with the greater surface of the metal bath in a reverberatory furnace, that the salt fluorspar flux method might be used in reverberatory melting.

On tests of a lot of commercial borings containing some 10 per cent of very fine dirt, the average recoveries, figured on the true metallic content of the chips, were as follows:

	Gas-fired crucible furnace	Electric crucible furnace	Small gas-fired reverberatory
No flux, per cent.....	55	..	.....
Volatile fluxes, sal-ammoniac, zinc chloride, etc., with stirring but without constant puddling, per cent..65-70		70	50-60
Retorting or stirring into molten metal, per cent....65-70		..	.....
Briquetted chips stirred into molten metal, per cent.... 75		..	.....
Puddling process, per cent..70-80		..	.....
Salt fluorspar flux, per cent..75-85		85	80-90
Briquetted chips with salt fluorspar, per cent..... 90		..	.....

Experiments have indicated that dirty, oily borings might be cleaned by washing with a weak caustic soda solution, perhaps freed from dirt on a concentrating table and dried by centrifugal force, but whether such cleaning would pay commercially is a question. It is also an open question whether briquetting will pay commercially. But it is certain that keeping the borings scrupulously clean and free from dirt or dust, keeping them free from contamination by iron or brass chips, and removing water soluble cutting solutions, are advisable, and that the higher recovery from clean chips will pay richly for a little extra care in the machine shop.

Ingots obtained from borings by either the puddling or the salt-fluorspar process can be used in many simple castings up to 25 per cent of the mixture without detriment to the quality or strength of the castings and without an increase in foundry defectives. If iron is kept out, the composition will not change materially in refining, and, if desired, a furnace or two can be kept busy on borings, and the molten metal mixed in the desired proportions with new metal from other pots, the castings being poured direct without reheating the metal obtained from the chips.

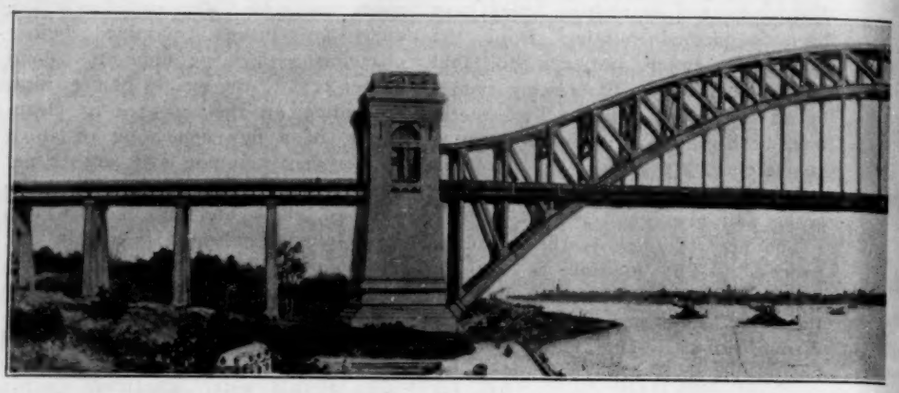
The Goldschmidt Thermit Co., 90 West street, New York, has published an exceedingly interesting and profusely illustrated 76-page booklet on the use of thermit in repairing rolling mill castings. The book also covers the applications of thermit to foundry practice, including making semi-steel in the ladle and the use of titanium-thermit cans. The 60 pages which are devoted to rolling mill work contain complete directions for repairing various classes of rolling mill machinery by the thermit process, including drawings and photographs covering the work in considerable detail. The book is well arranged and thoroughly indexed, which adds to its convenience.

Plans are being drawn for an office building for the Western Reserve Steel Co., Warren, O., to be two stories, brick and steel, and cost about $20,000. It will be located close to the company's plant, near the site of the present office.

It is a good practice to run most drills at high speed, almost to the point where the corners commence to wear, and to use a light feed. Don't take this as an ironclad rule, however, as conditions vary greatly and speed and feed must vary accordingly.

Erection of the World's Greatest Steel

SPANNING the swift currents between Ward's Island and Long Island, where the Harlem river meets Long Island Sound at Hell Gate, is now being erected the mightiest steel bridge in the world. The span is 1,016 feet 10 inches between the faces of the 260-foot towers, and 995 feet between center of bearings. The height of the arch is 140 feet at the end and 260 feet at the center. The width is 93 feet between the centers of railings and 60 feet between the centers of trusses. The adjacent view shows the bridge completed.



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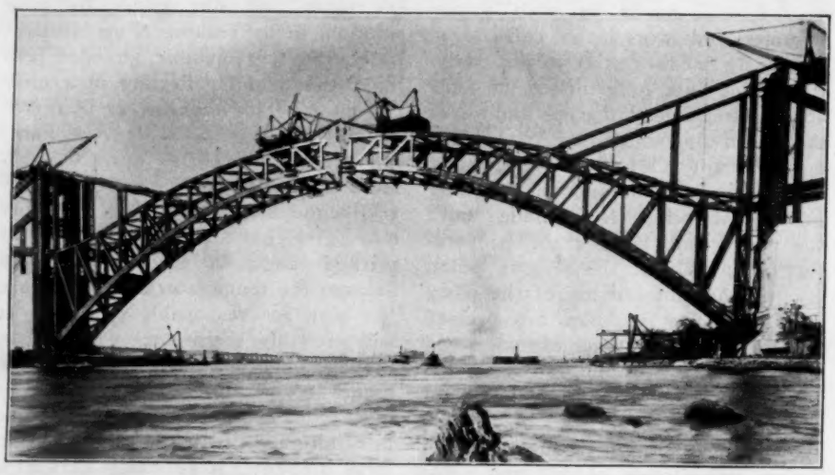
THE Hell Gate bridge is being built by the New York connecting railroad to join the Pennsylvania and the New York, New Haven & Hartford railroads. This connecting line is to be ten miles long, of which three miles will consist of bridges and viaducts. A continuous all-rail passenger route will be provided from Nova Scotia to the south. The trains will be tubed under the Hudson and East rivers and Manhattan Island. There are three bridges, one over Bronx Kill between the Bronx and Randall's Island; another over Little Hell Gate, and the big Hell Gate structure. On the right is shown the joining of the arch span, Oct. 1.



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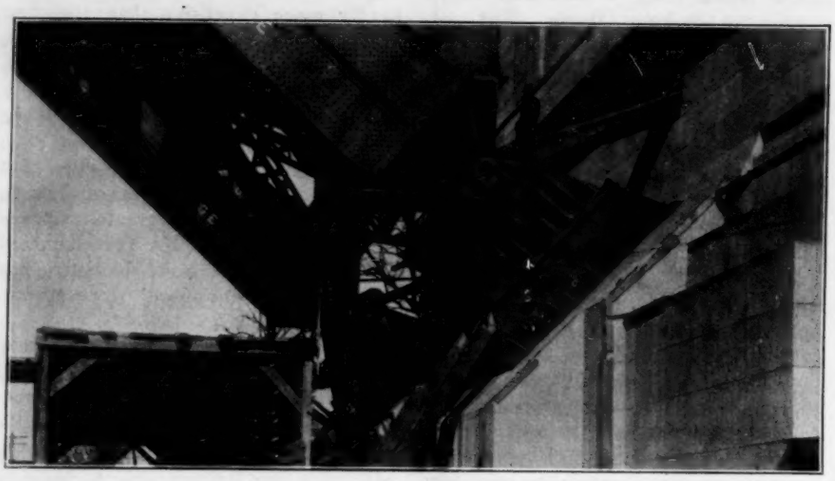
THE end shoes, of which there are two each on the Long island and Ward's island sides, are of enormous size and support the weight of the entire arch. Each shoe weighs 250 tons and is made up of 13 separate steel castings bolted together. The castings are curved to form the hinge. These shoes are shown in the view of the bottom construction of the arch presented on the right. On the opposite page is seen the special riveters' cage, which is made up of three stories, each 10 feet high. Gangs of men are able to work in each story at the same time, and the great amount of necessary riveting is done rapidly as a result.



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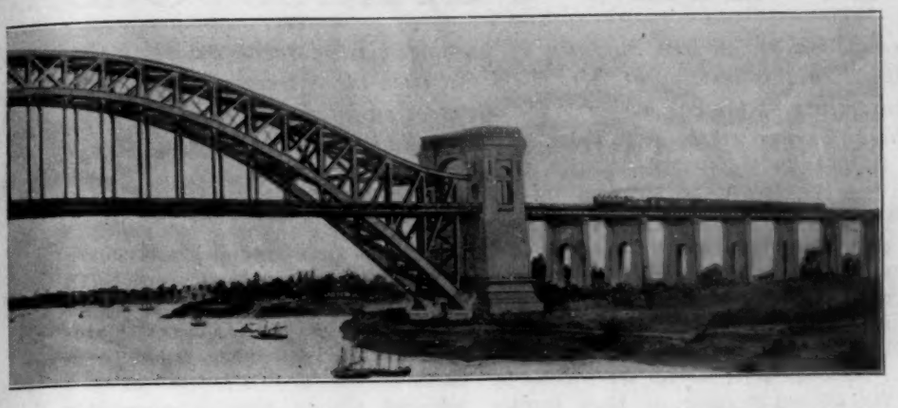
THE viaducts which approach the Hell Gate bridge and make up other sections of the New York Connecting Railway are 20 to 130 feet high. They are built of plate girder spans supported on masonry piers. Part of the viaduct structure is supported on concrete retaining walls with arches over the streets. More than 450,000 cubic yards of concrete reinforced with about 5,000 tons of steel is being used in the construction of the piers. The immense size of the piers and their

Bridge Joining Canada and South by Rail



general style of construction is shown by the view of the Ward's island viaduct piers on the right. The Hell Gate bridge and approaches or about 45,000 tons, are being built by the American Bridge Co., while the McClintic-Marshall Co. is performing the balance. Gustav Lindenthal of New York is the consulting engineer. This view was taken from the top of the tower of the Hell Gate bridge, and shows graphically the stately and massive character of the supporting piers. These have been likened in appearance to Egyptian structures.

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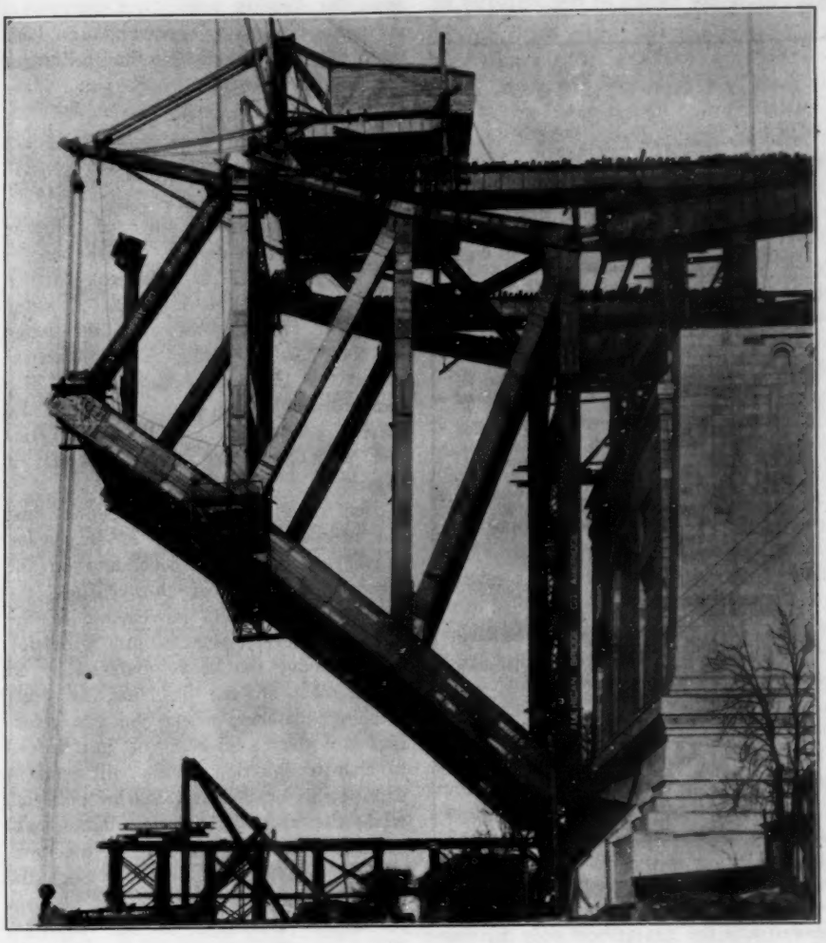

THE total amount of steel required for the bridge and viaduct work is approximately 90,000 tons. Of this about 26,000 tons is in the Hell Gate bridge, including 18,000 tons in the arch and 8,000 in the flooring. Some of the members of the bridge are the largest ever erected. This applies especially to the end members of the bottom chord of the arch, a view of which is given on the left. These are made up of two heavy webs, 2 inches thick, connected by top and bottom cover plates and by a central longitudinal diaphragm. Completed, they are 56 feet long, 11½ feet high and 6½ feet wide. These members as shipped from the shop weighed 150 tons and when completed, 185 tons. All the principal members of the bridge are of high carbon steel. Nowhere more clearly and interestingly than in bridge construction is the advance which has been made in steel manufacture and structural design exemplified. It is only necessary to compare the clean, simple outlines of the great Hell Gate bridge with the intricately cross-braced affairs which were marvels of an earlier day, to realize that greater strength of material, permitting the elimination of numerous members, has revolutionized the designing of bridges. Another interesting phase of the building of this colossal bridge is the fact that in its erection but few casualties occurred.

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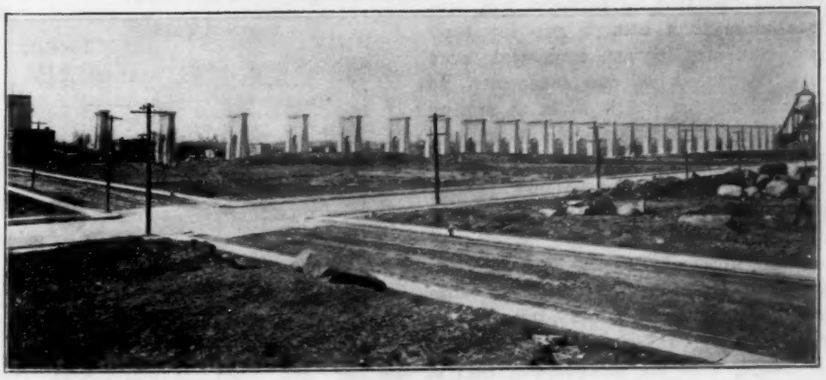


WORK upon the viaducts and bridges was started simultaneously at the Bronx end and on Long island in 1912. The Hell Gate bridge towers were started in September, 1912, and the viaduct piers on Randall's island, Ward's island and Long island in February, 1913. The Long island piers appear at the left. It is expected that the work will be completed by the end of 1916 or early in 1917. The American Bridge Co. and the McClintic-Marshall Co. are fabricating and erecting the steel work.

Utilization of Blast Furnace Gas

THIS paper is an able presentation of modern methods of burning blast furnace gas under stoves and boilers. In this installment, Mr. Diehl discusses the character of this gas and the requirements of the gas burner. He advances an interesting suggestion for determining burner efficiency. Two other installments will follow.

By A. N. Diehl

THE proper presentation of the topic suggested by the paper committee of the institute is almost as difficult as the problem itself. It may be best to approach the subject by a brief description of blast furnace gas, and then outline the methods in use under the subdivisions of stoves and boilers, and describe them in connection with the various confirming tests and practices employed. While volumes of tests have been published on coal-fired boilers, it is extremely difficult to find very much accurate and authentic data on those using blast furnace gas. For this reason it might be well for the published transactions to contain a number of such tests in detail, as observed by experienced steam engineers in several of the principal plants of the United States Steel Corporation. For this reason there are included some tests both of stoves and boilers in greater detail than necessary in the text of this paper.

From carefully calculated heat balances it is shown that about 48 to 50 per cent of the thermal value of the fuel used in the blast furnace, passes from the top in the form of sensible and latent heat in the gas. Our efforts to lower fuel ratios aside from raw material improvement, have been principally in increasing hearth temperatures. This increment is best obtained by hotter blast, therefore better and more efficient contact with the brick-work of the stove. To accomplish this, about 30 per cent of the gas generated per ton of iron is used, allowing 60 per cent to be used in boilers or engines and a 10 per cent loss. The desire for higher heats thus forced better stove construction and combustion into prominence, as an indirect means of lowering coke consumption. However, the saving of 12.3 cents per ton of iron, by increasing boiler efficiency from 55 per cent to 65 per cent in burning the other 60 per cent of the gas, h[a]s been almost overlooked. It has been only recently that anything but spasmodic furnace-gas boiler tests have been made, and these only for passing information. Practically no recognition was given them, except to acknowledge conditions were bad, and but few attempts were made to correct the discrepancies which the tests revealed. The tests seldom reflected usual operations, since boilers were often overhauled and repaired for starting, giving erroneous ideas of the general prevailing condition.

Although great savings are possible by the efficient burning of blast furnace gas, yet to the minds of the majority of operators it was a problem of minor importance, as pig iron was the commodity desired and the gas at best only a necessary adjunct. Coupled with this idea was the fact that all furnaces will produce more than enough gas for their own auxiliary power equipment even with the crudest boiler arrangements. So it would not be worth while to expend thought or capital for unnecessary efficiency for the privilege of opening the bleeder a little further. This accounts for so little engineering judgment used in many boiler installations.

Blast furnace consists essentially of the unoxidized carbon monoxide remaining from the primary combustion of the coke in the hearth. As the air comes in contact with the incandescent fuel at the tuyeres, the oxygen and carbon form theoretically an unsaturated gas, CO, with reducing properties, and at a high temperature. As the CO comes in contact with the descending oxides it is partly oxidized to CO_2, but still contains sufficient CO to make it a valuable asset for heating and power purposes.

An average blast furnace gas on lake ores has approximately the following analysis by volume:

	Per Cent.
Carbon dioxide (CO_2)	12.5
Carbon monoxide (CO)	25.4
Hydrogen (H)	3.5
Hydro carbon	0.0
Nitrogen	58.4

This gas will have a thermal value at 62 degrees Fahr. and 30 inches barometer of 92.0 B. T. U. The gas further contains about 30 to 35 grains of water per cubic foot, depending on the water in the charge, either from material causes or used for dampening. The temperature of the gas varies with the driving combustion and length of contact with the stock through which it passes.

Fine ores, coke and limestone dust are mechanically carried in suspension in varying quantities, depending on the physical condition of the charges, the velocity of gas, and movements of the stock. In every plant a first provision is to remove the heavy material by an enlargement of the gas flue, or dust-catching chamber, where the gas velocities are decreased and the gas forced to change direction. This will tend to deposit this heavier and coarser material, while the finer divided and lighter will be carried on and deposited in the flues, or escape to the atmosphere through the stacks of the stoves or boilers. A proportionate percentage of the deposited dust, with the physical condition of the same, might show as follows:

ANALYSIS

	Per Cent.
SiO_2	8.19
Fe	38.89
P	0.069
Mn	0.51
Al_2O_3	2.52
MgO	0.31
H_2O	14.30
C	12.87

Percentage of total dust carried beyond dust catcher = 28 per cent.

Fineness of total dust carried beyond dust catcher = 92 per cent through a 300-mesh screen.

Naturally these conditions are subject to the variation of each local installation, as the number of pockets, sizes of dust catcher and flues, together with the

Outline of Paper

Introduction.
Blast Furnace Gas.
- General.
- Flue Dust.
- Moisture.
- Clean Gas.
- Combustion.

Requirements of Burner.
- Burner Efficiency compared to Boiler or Stove Efficiency.
- Burner Efficiency of 100 Per Cent.
- Flame Intensity.
- Classification of Burners.

Stoves.
- General.
- Test of Stoves and Burners.
  - Type I—Duquesne, Edgar Thomson, and Wisconsin Steel Companies.
  - Type II—T. C. I. & R. Co., Ensley.
  - Type III—Edgar Thomson and Boynton, Lorain.
  - Type IV—Freyn, South Chicago.
  - Type V—Wisconsin Steel Co. and Central Furnaces, Cleveland.
- Remarks on Stoves.
- Stove Comparisons.

Boilers.
- General.
- Present Equipment.
- Tests of Boilers and Burners.
  - Type I—Duquesne and McKeesport.
  - Type II—So. Chicago, Wisconsin and Youngstown.
  - Type III—Duquesne and Monessen.
  - Type IV—Duquesne.
- Remarks on Boilers.
- Boiler Comparisons.
- Apparatus and Observations.
- Calculations.

General Conclusions.

Presented at the Cleveland meeting of the American Iron and Steel Institute, Oct. 22. First of three installments. The author, A. N. Diehl, is assistant general superintendent, Duquesne works, Carnegie Steel Co.

quantities and velocities of gas, will influence the disposition of the dust.

The moisture is present as vapor, and, if the temperature of the gas is lowered beyond the dew point, water will be accordingly deposited, as the gas will remain in a saturated state. This condition arises only with highly wetted charges, unusually low gas temperatures, cold atmosphere, or high radiation.

This constitutes our dirty gas which is conducted to the stoves and boilers in our past and present practice.

Within the past few years the economy of higher heats, as well as the repairs and expenditures in stove practice, have most clearly demonstrated the economic value of further cleaning the gas. This can be done in various ways. A dry filtration method has been working with apparent success in Europe, but does not have to contend with the large percentage of fines which the American Mesabi practice has to contend with. Wet mechanical washers are in use, but the simplest is a spray tower with provisions for the prevention of gas channelling. It is necessary in this case to use sufficient water not only to remove the dust, but also to cool the gas low enough to remove excessive moisture. If the gas is not cooled after being subjected to water contact, the moisture content is such as to either prevent combustion or carry the thermal losses in the stack so high as to make the operation decidedly uneconomical. By proper washing, the dust is lowered from 3 grains to approximately 0.2 grains per cubic foot, and the moisture from 30 grains to 8 to 10 grains. The lowering of the gas temperatures from 300 degrees to 80 degrees robs it of 220 degrees of sensible heat, which is balanced by the gain due to reduction of moisture and dust and the resulting cleanliness of heating surface. Tests conducted at Duquesne, show that equally high flame temperatures can be obtained from either clean or dirty gas. The average combustion chamber temperature from 19-24 hour tests on clean gas was 2040 degrees Fahr. on clean gas, and from 8-24 for tests on dirty gas, 2030 degrees Fahr.

Combustion

Blast furnace gas is made to yield its energy in three principal ways:

(1)—By combustion in recuperating chambers or stoves for the purpose of pre-heating the blast.
(2)—By combustion under boilers for steam generation.
(3)—By combustion in gas engines for blowing or power generation.

In all of the above divisions, the first principle to be applied is the supplying of sufficient oxygen to just complete the oxidation of the several combustibles present. Excess of air results in the dilution of the products of combustion, consequently in the lowering of flame intensity and the carrying away of a corresponding quantity of heat units in the stack gases. Insufficient air results in the lowering of flame intensity due to incomplete combustion, and the loss of calorific value of the gas in the stack does not compensate the gain due to the lesser weight of the flue gas. Thus it is obvious that for efficient combustion a proper mixer or burner is of primary importance.

Requirements of Burner

There have been very few operators who have not at one time or another put one or more pipes through a stove or boiler burner in order to get the so-called Bunsen effect. In the case of stoves these experiments generally terminated in two results. First, if the air-duct was sufficiently large to effect any decided change, the temperature of combustion was considerably increased and resulted in the flue dust, carried with the gas, fluxing with the brick in the combustion chamber, and either boring a hole through the same or filling the well with semi-molten or plastic material. Second, the stove from which a high temperature was obtainable, at first, ran down quickly, resulting in the operator's statement that the stove merely had a "flash temperature, but would not carry its heat." The air-pipes generally occupied so much area that the normal supply of gas was decreased in consequence, and an insufficient thermal capacity resulted. These efforts mostly resulted in failure, on account of the foregoing causes, and, instead of burning down stoves by flame concentration, air was allowed to enter through special doors or blow-off valves. In this manner the proper mixing was intentionally spoiled and the consequent flame temperature lowered, to preserve the walls from the subsequent fluxing action. Many of these difficulties are avoided in burning clean gas, and the temperature can be raised to its highest limit.

In the case of boilers, especially if air shortage was the prevailing condition, the placing of pipes or other aspirating devices around or through the burner occasionally resulted in small increases in efficiency, due to supplying more nearly the required amount of air.

In the testing and development of gas burners, the performance of the burner itself is of much greater interest and importance than that of the combined unit of burner and stove or boiler. On account of the difference in design of the different types, and the difference in condition and performance of the same, even in the same installation, it is both unfair and unreliable to judge the worth of a burner upon the basis of the combined efficiency of the stove or boiler on which it happens to be tested. The results obtained in this way have a direct application, at best, only to a similar type and size of the boiler or stove tested, and even then are not free from the inaccuracies which frequently occur in all but the most exact and pretentious forms of testing. For these reasons it has been considered advisable to suggest the term "burner efficiency"—to define a standard by which the qualities of a burner alone may be judged, and to develop methods of testing with that object in view.

It is apparent that an ideal burner will admit the theoretically correct mixtures of air and gas, and completely mix them, thereby producing a maximum flame temperature at the point of ignition. The performance of a burner, on the basis of this ideal condition, may be determined by the observation of flame temperature, and by analysis of products of combustion, both methods being useful in practice. A couple, inserted in the combustion chamber close to the point of ignition, furnishes both quick and reliable indications for the adjustment of air and gas openings in the burner to continuously produce the best state of combustion. The highest temperature obtained in this way is not necessarily the theoretical maximum, but merely the maximum that can be produced by the burner under the prevailing conditions. The observed temperature will be affected by the radiation from surrounding bodies and the possible presence of CO in the products of combustion. The calculated theoretical temperature will depend on the moisture in the gas and the accuracy of specific heat constants used. Therefore temperature observation cannot be an absolute standard of burner efficiency, and a method based on analysis of products of combustion must be used. If the products analyze carbon dioxide and nitrogen, with no oxygen or carbon monoxide, the combustion is perfect and mixing of the burner may be called 100 per cent efficient.

Locating Ideal Point

The next factor which is to be determined is at what point in the path of the gases this perfect condition should be reached. Theoretically, it is directly at the outlet of the burner or ignition point, and a combination of these conditions would give a theoretical burner efficiency of 100 per cent. Practically, this is very difficult to obtain, and we must assume a point a short distance beyond the burner, but well in front of the first heat absorption surface. It is therefore suggested that, as

a standard, a point 2 feet beyond the point of ignition be adopted as the point at which gas samples shall be drawn for a determination of burner efficiency, a water-cooled sampling tube, of course, being used. The definition therefore becomes: "A gas burner is operating at 100 per cent combustion efficiency when the analysis of a sample, drawn from a point 2 feet beyond the point of ignition, shows perfect combustion."

The next step is the calculation of the efficiencies less than 100 per cent. The basis is the calorific value of the fuel gas, and the loss is the calorific value of the unburnt CO present, plus the sensible heat contained in the excess air at the combustion temperature. The difference between the basis and the loss divided by the basis gives the burner efficiency.

For example: Assume—

COMBINATION CHAMBER ANALYSIS	Per Cent.	FURNACE GAS ANALYSIS	Per Cent.
CO_2	24.5	CO_2	15.0
O_2	0.5	CO	24.3
CO	0.7	H_2	3.3
N_2	74.3	N_2	57.4
Temperature	2050 degrees Fahr.	B.T.U.	88.0

$$\text{CO loss} = \frac{39.3}{25.2} \times 0.007 \times 324 = 3.5 \text{ B. T. U.}$$

$$\text{Air excess} = \frac{(15.0 + 24.3) \times (0.5 - \frac{1}{2} \times 0.7)}{24.5 + 0.7 \times \frac{1}{2}(24.3 + 3.3)} = 1.69 \text{ per cent.}$$

$$\text{Air required} = \frac{\frac{1}{2}(24.3 + 3.3) \times 4.78}{100} = 0.66 \text{ cubic feet.}$$

Air excess $= 0.0619 \times 0.66 = 0.0112$ cubic feet.
Sensible heat $(2050 - 62) = 41.3$ B. T. U. per cubic feet.
Sensible heat air excess $= 0.0112 \times 41.3 = 0.5$ B. T. U.
Total loss $= 3.5 + 0.5 = 4.0$ B. T. U.

$$\text{Burner efficiency} = \frac{88.0 - 4.0}{88.0} = 95.5 \text{ per cent.}$$

By this means, independent judgment may be passed upon the burner, freed from misleading statements of boiler efficiency, as well as from the standard figure of "Pounds of coke in furnace per brake horsepower hour" which has been advanced.

After a perfect condition has been attained, the remaining problem is one purely of boiler construction and heat absorption, precisely as in a waste heat boiler, and is quite apart from an investigation of burners.

As the efficiency of a boiler varies with the load, so will efficiency of a burner. Some burners are highly efficient at low loads, others at high loads, and the main problem is to develop a burner that will closely approach perfection at boiler ratings from 75 per cent to 200 per cent. The requirement is maximum flame temperature and the way to get it is by a perfect mixture of air and gas in the burner.

With the foregoing method, definite judgment may be passed on the comparative merits of different burners, but the question "Which, if any, special mixing burners would be advantageous?" is one which must be decided on a knowledge and appreciation of the details of equipment and operating conditions of the plant involved. If a boiler or stove has favorable conditions of pressure and draft, and a large mixing chamber, it may operate at a combustion efficiency approximately as good as could be obtained from the best mixing burner, in which case, new burners would not pay interest on the investment. Such operation is exceptional and generally requires very close regulation to obtain equal results. With the advent of clean gas, the majority of furnace operators feel the need of mixing burners, and in such cases, where a comparison of burners is the problem, the most reliable and comprehensive information will be obtained by methods of test and calculation leading to the determination of burner or combustion efficiency. Unfortunately there is not sufficient data available to compare the burners, discussed in this paper, on this basis. Therefore, the combined stove and boiler efficiencies must be resorted to. While this is not as satisfactory, as has been stated before, at least in regard to sensible heat loss, the fact remains beyond all dispute, that the quantities of CO present in the stack gases indicate very clearly the mixing possibilities of a burner.

Flame Intensity

Heat exchange between the bodies of different temperatures, varies in proportion to their means and, provided there is a sufficient heating surface, will evidently impart a higher ultimate temperature to the absorbent if the initial temperature is high, than if the combustion were such that a lower initial temperature were attained. The absorption of heat by the brick-work during the heating operation is also facilitated by high temperature due to the greater rate of absorption in the combustion chamber and top of the checker chamber, resulting in a necessarily lower stack temperature with equal quantities of gas and equal heating surface. Boiler heat absorption follows the same rule, except that the temperature of the heat absorbent, or of the tubes, is constant, while in the stoves the temperature of the brick absorbent is variable. On account of the greater difference in temperature, the heat in the gas can be absorbed far more quickly in the boiler, therefore in this case so much less surface is required.

Classification of Burners

Blast furnace gas burners may be classified under six general types as follows:

(1)—Rectangular or circular nozzle burner with air added around it or by separate air doors or a combination of both.

(2)—Rectangular or circular burners with air conducted into the gas jet by means of pipes or other openings.

(3)—Burners which subdivide air and gas into separate streams but do not mix in the burner.

(4)—Burners into which air is aspirated by means of an air jet at high pressure, as in a steam jet blower, the air from both sources mixing with the gas in the burner.

(5)—Burners through which all of the required air is forced and completely mixed with the gas before the ignition point.

(6)—Burners to which air and gas are supplied after being perfectly mixed in a fan which admits air on one side and gas on the other, discharging the mixture into a common outlet.

The foregoing has been a discussion of the general features of blast furnace gas combustion. From this point stoves and boilers will be taken up separately in the consideration of burner design and operating conditions, since the method of procedure is somewhat different in the two cases.

(*To be continued.*)

The Hauck Mfg. Co., Brooklyn, N. Y., has issued a bulletin under the heading "Saving Ways in Busy Shops". The bulletin discusses the use of Hauck burners in boiler shops, machine and pipe shops, foundries and in welding and brazing operations. Photographs and descriptions also are included of the company's line of crucible melting furnaces, portable kerosene and oil burners, kerosene torches, melting pots, brazing forges and small furnaces.

The plant of the Cleveland Blow Pipe & Mfg. Co., Cleveland, manufacturer of dust collecting and ventilating systems, safety sheet metal guards, etc., has been removed from West Third street to larger and more commodious quarters at 6302 Kinsman road. The new plant affords double the space of the former works and the output will be correspondingly increased.

Good Sense in the Steel Foundry

A PROBLEM always seems simple enough—after it has been solved. Common or horse sense applies just as aptly to foundry management as it does to other phases of human endeavor. In this article Mr. Muntz and Mr. Roubieu explain the causes and cures of troubles which most frequently beset the manufacturer of steel castings.

By G. Muntz and E. Roubieu

OF ALL the sciences which college professors tried to cram into our heads, geometry is that for which we have, perhaps, the fondest memories, probably because it teaches facts that will always appeal to the intelligence. Many of us have absorbed the innumerable theories and hypotheses of physics, chemistry and higher mathematics, while others, perhaps more fortunate, have gone as for as following such philosophical genii as Leibnitz, in abstruce demonstration that 2 plus 2 makes 4; but the only good we have derived from these studies is a better knowledge of our own brain powers, so that our professors' teachings are remembered as pure gymnastics of our intelligence.

If you have often wondered why you adopted the steel business as a field of endeavors you are one of many, and it is almost certain that, like the others, you simply answered the rather mysterious call of metallurgy in general, and of steel in particular; but you also discovered that as a continuation of previous brain exercises there is no greater source of satisfaction than that found in following our learned metallurgists in their researches on crystallization of steel; on allotropy in the iron carbon system, and on the better thermal treatment of steel after it has reached a semi-finished stage.

We can then say that in our younger days we have studied and possibly learned, but as far as remembering what has been taught us, there remains almost a blank; we have forgotten nearly everything, but we are strong in the knowledge that if we need data on a certain subject, we will know where to look for it. Our previous education has simply made of us composite directories; directories for our own use.

Must Crystallize Information

We will, therefore, assume that we know where the information we require is to be found, and that once the information is obtained, our previous training will enable us to understand it. By natural sequence we come to the point where we are fully informed and when the only thing left to do is to crystallize the information secured into plain everyday actions. This is where we find the greatest difficulty in carrying out the theory. You may know something perfectly well, but you may not be able to take full advantage of your knowledge because the efficient application of known facts to the attainment of maximum results require, among other things, discernment, tact, courage, speed of action, persuasion and self-confidence. In the steel foundry we must condense all these requirements into a particularly fine grade of common sense, and if this common sense embodies all the above mentioned qualities we believe that no one will

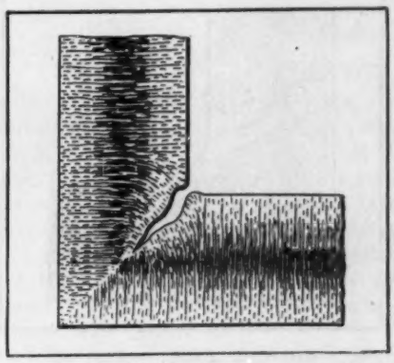


FIG. 1—HOW CRYSTALLIZATION MAKES CRACKS AT CORNERS

dispute our contention regarding the value of such an asset.

Knowing that we will bring the average melter or metallurgist to a high pitch of excitement, we will confess that we believe the actual steel making is the department where the least common sense is required. Once the problem is solved as to which melting method is to be used, steel will be produced according to fixed rules involving definite chemical reactions, and the resulting material will be an exact image of the operator's actual skill.

Assuming that the steel maker gives us good metal, his limitations will be those of the means employed, and no matter how skillful, he cannot produce a better steel than that which the furnace will turn out when efficiently used within its own field.

Very hot metal cannot be produced by the open-hearth process without endangering the life of the furnace; low carbon steels cannot be produced in plumbago crucibles, although they can be produced in an electric furnace; very low sulphur and very low phosphorus steels cannot be produced in a converter; not because the operators are not efficient or lack in skill, but because the various methods have their own limitations.

Choosing a process to meet one's needs, does not require common sense, it necessitates only simple exercise of the brain, and the compilation of the data available in technical literature. Once the chosen furnace is installed it will respond to every whim of the melter, until it reaches the maximum which it cannot surpass. No matter how improved our melting methods will become, they will always be applied according to the rules of the originators. Subsequent improvements will be made, but they will never be affected by the application of common sense; they will result from greater practical experience, and their discovery is, therefore, but a matter of time.

The aim is the production of steel of such chemical analysis as will best meet our varied purposes in the present state of metallurgical knowledge. After the steel leaves the furnace, the real work will begin and from then on, common sense rules supreme.

How Steel Catches Cold

We have reached the point where the melter, chemist, or metallurgist, as the case might be, has given us steel of a certain chemical composition. With this steel, within our own sphere, we want to produce a steel casting. We make a mold, provide suitable gates and risers, pour the metal and a good casting ensues. Six months later we make a similar mold, provide the same gates and risers, pour the metal and the result is utter failure. Knowledge is necessary to explain what has happened, but knowledge without judicial application of common sense would fail most miserably. Let us therefore study this first trouble of the steel foundryman in the light of common sense.

Let us suppose that instead of being at work, the steel foundryman is at play, either at golf, tennis or football. After a certain time he will be quite overheated, and if he then sits on

the cold ground or exposes himself to the cool air, he will catch a cold, which will be inversely proportional in intensity to the temperature of the ground or of the air; the lower the temperature the greater the cold. Ordinary common sense teaches us to take such steps as will prevent colds and it is all a question of self-preservation dictated by the fear of reprisals from an abused nature. Such reprisals as our body has in store for sudden exposure, are also latent in molten steel. The melting period of the metal cannot be better compared than to the exercise of the foundryman at play, and as far as catching cold, the parallel is even stronger, when we pour the extremely hot metal into comparatively cold molds.

Pouring conditions in the steel foundry change daily, almost hourly, and much trouble would be obviated if these conditions were more carefully observed, and steps taken to correct such variations as may occur. It is evident that molten metal will behave in as many ways as it is poured into molds at varied temperatures. It is, therefore, necessary to study the causes governing these occurrences.

The first factor in these changing conditions is the temperature of the metal itself. In the open-hearth furnace variations might be due to change in fuel quality, length of operations, bulk of the raw materials, conditions of operation, etc. In the converter process, silicon contents of raw materials, dryness of air blast, temperature of molten charges from cupolas or blast furnaces, contribute to a considerable extent to the variations of temperature in the metal ready to cast.

The second factor comprises the receptacles or molds in which the metal is poured. These vary in temperature almost as the weather and also with that of the foundry which increases as the pouring of large quantities of metal goes on.

The third factor covers the humidity of both the air and the molds, which affects temperature on account of the amount of heat expended to dissociate the steam evolved under varying degrees of humidity. The intermediate receptacles, as ladles, used to carry the molten steel, need not be considered, as they are under easy control, so that the steel, once in them, will represent almost the same variations in temperature as when it left the producing furnace.

We are therefore in presence of metal, which at the time of casting, is at a temperature that can only be ascertained at great cost of time and is consequently often guessed at; we pour it into lukewarm molds in the summer and almost frozen ones in the winter. The result is that if we are content to duplicate exactly the molding operation, success will be uncertain.

In the case of a casting apparently molded twice in identical fashion at different periods, failure can only be ascribed to changed conditions of temperature. The steel was either too hot or the mold was colder than usual, and the metal, upon catching cold, sneezed and coughed, causing hot cracks or shrink holes in places where they had not been expected. The conclusion is that the steel foundryman had reproduced all the desiderata of success until he forgot to consult his calendar or his thermometer. Temperature conditions were not duplicated, steps to offset the change were not taken, the steel was vexed at the oversight and caught cold.

As we go ahead, we reach more and more complex problems. The metal

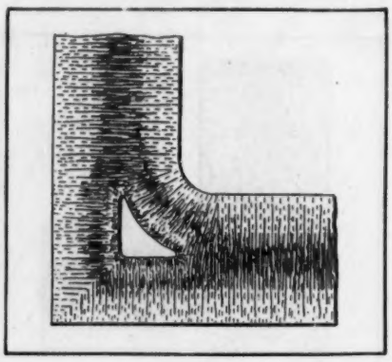


FIG. 2—HOW A FILLET CLOSES THE CRACK AND PRODUCES A CAVITY

is now in the mold and is solidifying. Steel contracts when passing from the molten to the solid state, but it also crystallizes and the two phenomena of contraction and crystallization will have to be studied in order to determine how they hamper or help each other while taking place simultaneously.

Expansion and contraction of steel are in themselves very simple subjects of analysis. If the steel were poured in an ideal mold in which the walls would have no capillary action on the solidifying mass, and if the final casting was of such shape that one part would not cool more rapidly than another, then our problem would be simple and we would not need to trouble our heads so much about risers.

Unfortunately, steel castings are made in sand molds, in which the walls are of such nature as to cause the metal to cling to them, so that it will sink faster at one spot than at another. Furthermore, the great majority of the castings are of irregular shapes and sections. One part will cool faster than the one next to it, there will occur pulling and straining, and if the cast is not properly fed there will be trouble a-plenty. This question of feeding steel castings is about the most arduous the steel foundryman has to face. Volumes and cyclopedias could be written on the subject, but no amount of teaching will replace good, hard-headed common sense, when groping for a solution of this problem.

To feed cooling metal, we have to draw on another mass of cooling metal, and as far as steel castings are concerned, there can be no general rule as to how this auxiliary mass of cooling metal should be located or as to what bulk it should have. This might explain why many a steel casting shows a hole under a riser, the object of which was to avoid just such a cavity. If the riser is smaller than the part it is to feed, it will cool first and will reverse its purpose by feeding on the casting, so that the latter will either be spongy or its final shape will be at variance with the original pattern. If the riser is too large, part of it will be absolutely waste. There exists, therefore, a happy medium, which is to be found only in the realm of common sense.

The hope has been entertained that the study of cooling ingots would prove a valuable parallel to what happens in the steel foundry, but the sooner this fallacy is exploded, the quicker the steel foundryman will succeed in his field. A steel casting in the process of solidification might, however, be compared to an agglomeration of cooling ingots of different sizes, each of which acts for itself and most of the time at the expense of its neighbors. Risers of different sizes and shapes must, therefore, be provided at various locations to offset this battle royal of component parts cooling each as it can and often as it pleases. If taken integrally, the above assertion would mean the placing of risers over almost the entire area of the cooling surfaces. That is why common sense is again to be called upon, whereby one part of a casting is made to feed on another, the latter feeding on the next one and so on, until we reach a riser which feeds the last and most abused portion.

We then come to the crystallization part of the solidifying process. Before common sense can be applied we must recall the one and only general law concerning the formation of crystals; no matter what final form or system will be assumed, crystalliza-

tion will always take place perpendicularly to the cooling surfaces. In a casting, the cooling surfaces are all those in contact with the mold and cores so that the lines of crystallization will in the usual mold be orientated in every direction. The two sketches, Figs. 1 and 2, illustrate better than words what we mean.

Fig. 1 explains the why and wherefore of fillets in castings, while Fig. 2 shows the direct effect of a fillet. In Fig. 1 we see why a "sharp corner" will be weak due mostly to a break occasioned by interfering lines of crystallization. In Fig. 2 we remedied this weakness, but we created a body of metal larger than the neighboring ones, and the latter, freezing first, feed on the former, creating a cavity. This is another instance where nature seems to take things in its own hands, by trying to render all sections uniform. The last example shows in how poor harmony crystallization and contraction work. We went to the trouble of providing a fillet to help crystallization and then contraction steps in, occasions a cavity and destroys most of the gain we anticipated making. Here common sense becomes taxed to the utmost. Feeding by risers does not usually avail in this case, and forceful means must be devised to handle the situation. We usually resort to chills, so that the larger body of metal through greater speed of cooling will freeze as fast as the neighboring smaller ones.

Chilling, as far as the means of practicing it is concerned, is one of the best exercises for imagination and incidentally for display of common sense. Some use nails or bars of steel protruding in those parts of the mold where the large bodies of metal will be located, others use chills against such surfaces as must be more intensely cooled. As far as advocating any particular method is concerned it is useless, as in the steel foundry no two cases are alike. Each requires special diagnosis and corresponding treatment. There are no absolute rules and regulations for the production of sound castings and the only medium where the steel foundryman will find solace is in his own common sense.

Common Sense as Applied to Solidified Metal in the Semi-Finished State

What is solidified metal in the semi-finished state? In our case we will define it as being a steel casting which most steel foundrymen will be glad to ship as it is. It is sound, true to pattern and comes well within the chemical requirements of the customer's specifications. The chemist or metallurgist and the steel foundryman have apparently worked in perfect harmony, "everybody is happy," the casting is considered by many as ready for shipment, while others, not entirely satisfied, will proceed with physical tests.

In the second case a most extraordinary thing often happens; the physical tests prove the casting to be a failure. Such a perfect piece of workmanship cannot be wasted, and because we have heard of the benefits derived from annealing, we resort to it half-heartedly. A new test is made and failure is again recorded. To obtain a glimpse of what has happened, let us give an example.

Assume a casting provided with several test pieces, and yet the annealing process be repeated at various temperatures. If for the sake of simplicity, we disregard chemical analysis, the results will, as experience shows, average about as follows:

Annealing temperature, deg. Cent.	Tensile strength, pounds.	Elastic limit, pounds.	Elongation in 2 inches, per cent.	Reduction of area, per cent.
Not annealed	67,300	32,700	14.6	17.0
750	66,700	32,000	8.1	14.2
800	70,280	34,100	20.7	28.2
850	72,960	39,800	22.5	29.7
900	72,700	38,400	20.0	26.7
1,000	74,100	37,000	14.0	20.4

An explanation is useless; the figures speak for themselves and prove that many a crime is committed in the name of annealing. Common sense does not avail much in this case, except that it will drive the steel foundryman to study the direct effect of heat when applied to steel in the semi-finished state. And here is where the trouble begins.

We consult authorities and we are faced with theories and controversies of the most bewildering character. Allotropy, carbon and subcarbide theories, solution hypothesis, etc., are encountered and after a few more remarkable additions to his vocabulary the steel foundryman will throw up his hands in despair and wonder what our learned metallurgists are "driving at".

It is human that we should fail to use our most sterling qualities when we need them badly, and in the present case, the greatest asset of the steel foundryman should be not only taxed, but abused, to force the mind into the proper channels.

Let us again consider the steel foundryman at play. This time there is no over-exertion on his part, he has been successful and has purchased an automobile. He has been driven over smooth roads when suddenly he comes to one of those bumpy highways in which this country abounds. The family jumps and thumps about in the car and all of a sudden there is a jar, the sharp report of breaking metal and the foundryman finds himself in a wreck. An axle has broken, or some of the gears have lost their teeth.

Through force of habit, the steel foundryman will examine the metal fracture and if it appears sound, will ascribe the trouble to weakness of design. He might be right and he might be wrong, but it is safe to say that with the present knowledge of the resistance of metals, there are more chances that he will be wrong. To save tires, automobile manufacturers strive to make lighter cars, and as weight cannot be reduced at the expense of safety, the component parts of metal must, therefore, be made lighter but of materials of greater unit strength.

The table we have given previously shows that under proper annealing decided improvements can be obtained, but if we should stop at this point we would have solved only a small part of the problem. It behooves, therefore, to become more intimately acquainted with steel.

When we considered steel passing from the molten to the solid state, we dwelled on crystallization, but inasmuch as contraction stepped in to make trouble, we could not, at the time, study the properties imparted to steel by different crystalline structures. It would also have been useless, because the freezing and cooling steel casting was considerably restrained in its natural contraction by the resistance of the mold and was transformed into a real accumulator of strains which only await an opportunity to assert themselves. The finished casting is, therefore, a composite of crystals held together by cohesive power and of strains which if properly encouraged will cause fractures. Until recently these strains absorbed the entire attention of the steel foundryman, and for most, a simple reheating with subsequent slow cooling remedied the trouble.

The table already referred to shows, however, that the temperature of reheating has considerable importance and that it is possible while destroying strains to so change the crystalline structure as to render the casting worse than it was at first. This has been appreciated but has sometimes resulted in the most extraordinary conclusions on the part of certain steel foundrymen. As a characteristic

example we will only mention the one who advocated no annealing to save his firm $50,000 a year. Let us, therefore, disregard annealing as a means of destroying strains and let us begin a better acquaintance with the crystalline being of the steel casting.

The process of solidification of steel is not a gradual transition from the liquid to the solid state. It is a process of crystallization which means a definite physical change accompanied by an evolution of heat. We are thus in presence of a liquid body which is simultaneously under two contradicting influences. The formation of crystals is, on the one hand, enhanced by the external cooling agents, and on the other hand retarded by the internal evolution of heat. It is, therefore, evident that there exists a tendency within bodies of solidifying steel towards equilibrium between radiating and evolved heat, and if conditions are favorable the latter will gradually become equal to and later surpass that lost to the external cooling agents, so that an actual increase in temperature of the mass will be evidenced. This is noticeable in iron and steel and at that moment the metal is said to recalesce, which explains the name of "recalescent point" used to define this paradoxical occurrence.

Once the recalescent point is reached the steel has assumed a definite structure and it ensues that if this structure is to be absolutely obliterated because it is not suitable for the purpose intended, the metal will have to be brought back to a well defined temperature, which will be superior to that of the recalescent point. It is also evident that crystallization will occur more and more slowly as we reach greater distance from cooling influence and inasmuch as crystals will be inversely proportional in size to speed of cooling, the texture of the inner bodies of metal will be coarser than that of the outer portions. This explains why in a steel casting we are confronted by textures differing widely in various sections. Coarse crystalline structures are weak, while a fine grain is conducive to strength; the best results from a casting require, therefore, a fine and uniform crystalline body.

While the casting is cooling in the mold, it is needless to trouble about crystalline structures. The main desire is then to produce soundness and trueness to pattern. But after the casting has been liberated from sand, gates, risers and fins, treatment should be applied so that every particle of the metal will possess the maximum strength. It is now possible for us to realize that heating slowly to a well defined point and subsequent slow cooling, after temperature equilibrium has been maintained for some time, will result in making the crystalline structure more uniform. That is the entire theory of annealing. This article, however, is not the place to advocate any particular temperature at which annealing should be done. As a matter of fact this temperature changes with the chemical composition of the steel, and the foundryman must then suit his annealing to each particular case.

Outside of plain annealing, there must also be considered the different crystalline structures brought about at various temperatures. It is evident that certain textures will be conductive of better physical properties than others, and as some of them appear at high temperatures, common sense wonders as to the means of their preservation under ordinary conditions. If we heat steel to such a point as we know will insure the proper crystalline structure for the purpose intended, we must also devise means of preserving it. This we do by quenching. Here again is where the steel foundryman can exercise both his brains and common sense. Quenching media can be compounded to suit every fanciful imagination; we can use cold water, luke-warm water, brine, lead, avidulated water, oil, etc., but as usual, in the foundry, to the minimum frills will correspond the best results.

Good Nature in the Steel Foundry

Experience has taught the steel foundryman that there is very little gratitude to be expected from purchasers of steel castings. Specifications are becoming more and more rigid, greater skill is expected to meet them, but still customers will "shop around" and often will leave a foundry that has given them entire satisfaction and that has perhaps taught them their actual knowledge of steel castings. This is, however, the privilege of him who buys, and common sense must lead one to be good natured and accept the situation as it is and not as it should be.

It is very easy to cut prices, and for the steel foundryman who knows his trade, it is child's play to meet such cuts within reasonable limits. It must be said, however, that if costs are well known, and if profits are fair, such cuts cannot be met honestly. For instance, castings bought under specifications are provided with test pieces. Chemical requirements are easily met and if the test piece fulfills the mechanical requirements, the steel foundryman is supposed to have satisfied all the terms of his contract. The true foundryman knows that a steel casting can be so treated that the test piece will answer all the requirements, while the casting itself will be a failure. To the unscrupulous, this is an excellent way of cutting prices by saving on costs. In the long run, there is no economy in saving by impairing quality and many a purchaser has found out the truth of this statement, at his expense, while trying to save by accepting lower quotations.

There are many reasons why the steel foundryman deserves the same regard as we have for our personal attorneys and physicians. The steel casting business is one where precedents do not count; problems change daily and previous experience is useful only so far as it shapes the mind, and enables greater ease in the solution of new puzzles. This will be recognized some day, but in the meantime the lack of recognition must be faced good naturedly by the steel foundryman.

On the other hand, one's common sense varies daily in intensity. We are all duller some days than others, we make mistakes. This is where good nature steps in and forces us to greater efforts by discounting discouragement. Inasmuch as our problems are difficult, let us face them smilingly, and let us forbid common sense from interfering with our happiness, by judicious culture of a sense of humor.

A fitter after setting a meter failed to make the usual test after turning on the gas, and consequently did not discover a leak that caused a personal injury to the consumer as well as damage to his property when a lighted match was used to search for it. Forgetfulness has caused many a train wreck, many a catastrophe, so be careful not to forget to perform all of your duty and not only part of it.

The Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., has just issued two leaflets describing its belt-driven and engine-driven alternating current generators, respectively. The capacities of these generators range from 25 to 1,750 kilovolt amperes. They are thoroughly described and illustrated in these publications. A number of installation views of each type are also shown.

A new item added to the Portuguese customs tariff by a recent decree makes iron or steel, shaped or grooved, for use in the construction of buildings, plain, painted, or varnished, dutiable at $0.0103 cents per pound.

News of Employers and Employes

Cleveland Strikes Fought by National Metal Trades Association

Collapse—Troubles Continue in New England

STRIKES of machinists at Cleveland plants have completely collapsed. Facts in regard to the five leading strikes are as follows:

Warner & Swasey Co.—Duration of strike three weeks—declared off—all back to work on the same conditions as when they went out.

Standard Tool Co.—Duration of strike two weeks—one thousand went out—strike declared off—all back to work on exactly the same conditions as when they went out.

National Acme Mfg. Co.—Strike 11 days old—declared off—all back to work on exactly the same conditions as when they went out.

Bardons & Oliver.—Strike a little over two weeks old—360 men called out—strike declared off—all back to work on the same conditions as when they went out.

Peerless Motor Car Co.—Strike 10 days old—over one thousand men out when strike was called—declared off—all back to work again on exactly the same conditions as when they went out.

The demands of the strikers have been successfully combatted on account of the close association of the manufacturers and particularly on account of the assistance rendered by the National Metal Trades Association through its secretary, Philip Frankel.

Work of Agitators

Charles L. Taylor, of the Taylor & Fenn Co., Hartford, Conn., and president of the Manufacturers' Association of Hartford County, in a public statement says that no concessions will be made by the manufacturers of Hartford to the striking employes of the various factories. He explained that outside agitators have affected the business of the city; forced into idleness contented employes, and attempted to injure the reputation of Hartford. He reviewed the industrial conditions as relating to that city and ventured the prophecy that the present agitation will fail of its purpose. According to Mr. Taylor, there were 18,000 employes at work in Hartford before the arrival of the union's organizer. With reference to conditions at the Pratt & Whitney Co., he says: "It increased wages voluntarily and liberally since the fall of 1914, until it is now actually paying the highest wages of any machine tool building concern in this country."

The eighth strike in Hartford occurred Nov. 1, when employes of the Jewell Belting Co. walked out, after their demands for an eight-hour day, time and one-half for overtime and double pay for Sundays and holidays, had been refused. Charles E. Newton, treasurer and general manager, estimates that about 10 per cent of the whole force of 300 employes went out. The company has several large contracts for sword scabbards for one of the warring nations.

Up to Date Buildings

The Standard Chain Co., Pittsburgh, has just completed a large addition to its plant at York, Pa. The new building is 230 x 240 feet, with an auxiliary building, 60 x 420 feet. The additions are noteworthy for the accommodations which have been furnished employes. A large room is provided with tables and benches on which employes can eat their lunch. The company will furnish hot coffee free, both at noon and at midnight.

On the second floor is a well-lighted reading room which will be provided with trade journals and periodicals. Ample toilet facilities are distributed throughout the plant, including sanitary terra-cotta wash stands with hot and cold water. In a special room are materials for first aid to the injured, under the supervision of the safety first committee.

The handsome office building just erected is provided with all modern conveniences. On vacant property near the new plant, there is a base ball diamond. Tennis courts are being laid out for the employes. John C. Schmidt, York, Pa., is president of the company.

New England Situation

According to the weekly statement of Donald Tulloch, secretary of Worcester branch, National Metal Trades Association, on the condition of the machinists' strike in that city, the total number of men affected in the seven weeks is about 3,000 and the total loss in wages to the men and their families is approximately $237,000. He says that conditions of employment in other cities are not as represented by union officials, as is proved by letters from Bridgeport, Conn., and Ilion, N. Y. These in substance advise men to stay away from Bridgeport because there has been such a rush from the strike districts that it is much overcrowded and men are walking the streets who cannot secure employment.

Employes of the Billings & Spencer Co. foundry, Hartford, Conn., struck Nov. 3 for an increase in wages. The union claims that 200 men went out, but the company says not more than 140 left their work. The plant employs between 600 and 700.

Additions to the ranks of the strikers at the Jewell Belting Co., Hartford, Conn., have brought the number out there up to 50. They ask an eight-hour day with no decrease in wages.

At a meeting of about 800 employes of the Underwood Typewriter Co., Hartford, Conn., last week, it was voted to present demands to the company for an eight-hour day, time and one-half for overtime, double time for Sundays and holidays, and a readjustment of the piece work schedule so that the change in hours will mean no reduction in pay. The company employs about 3,000 men. The demands were not presented the company at the time scheduled and it is said they will not be until the shop is better organized. The same is also said of conditions at the Colt's Patent Fire Arms Co.'s factory. The Hartford union has voted to pay the expenses of 100 members who are on strike there to Bridgeport to enter the employ of the Remington Arms Co.

The 350 striking employes of the Springfield Metal Body Co., Springfield, Mass., who quit work Oct. 26, returned to work Monday morning (Nov. 8) as a result of a compromise agreement effected between the officials of the company and the conference committee of the employes. This calls for a 50-hour week instead of the present weekly schedule of 54 hours. Stipulation is made for a 48-hour week, as soon as contracts which have been figured on a 54-hour week basis have been completed. The concessions are made without loss of pay, and provisions are also made for the regulation overtime pay of time and half-time, and double time for work on holidays and Sundays.

Business News of Nation's Capital

Repudiation of Seamen's Law by Chairman McCombs Causes a Sensation —May Cause Split in Administration's Forces

Washington, Nov. 9.—Division of sentiment within the ranks of the Democratic party with regard to merchant marine legislation showed a further breach last Thursday, when the seamen's act became applicable to American merchant vessels. The interview given out in New York by William F. McCombs, chairman of the Democratic national committee, condemning the law, and urging its repeal, was a mild shock to some officials in administration circles. It was accepted not only as indicating a spirit of boldness and independence on the part of Mr. McCombs as head of the committee, but also a repudiation of the propaganda begun by Secretary of the Treasury William G McAdoo and Secretary of Commerce William C. Redfield in favor of the government ship purchase bill. As is well known, Mr. McCombs and Mr. McAdoo have no affection for one another, but this is not thought to be an element in the situation; rather it is believed that Mr. McCombs represents the thought of a large number of important Democrats as to what should be done to build up a merchant marine.

Despite the fact that Mr. McAdoo is a cabinet officer, and Mr. McCombs is head of the national committee of his party, the recent expressions of neither have been given the official O. K. of President Wilson, and until he does make himself clear as to his intentions toward merchant marine legislation, there is no positive way of telling whose plans he approves. Of the two, it is no doubt the general belief that the President still clings tenaciously to the McAdoo idea, favoring reintroduction of the ship purchase bill at the next session of congress.

However, if Mr. McCombs and his Democratic associates in accord with him on the proper kind of merchant marine legislation choose to do so, they could no doubt make a most decidedly embarrassing issue for Democratic advocates of the ship purchase bill. This, though, is considered to be a remote possibility, particularly in view of the fact that it would be sure to split the party on the eve of the opening of the presidential campaign.

Mr. McCombs asserted that the seamen's act was never a Democratic measure and that the Democratic party made a mistake in allowing Senator La Follette to foist his theories upon them. The fact of the matter is no record vote was taken on the bill, but support for it came liberally from both parties, and, instead of allowing Mr. La Follette to force his theories through, it is the prevalent opinion that it was the International Seamen's Union of America, headed by Andrew Furuseth, that made congress and President Wilson respond to organized labor's will by seeing that the bill found its way on the statutes. The same measure, however, was previously vetoed by a Republican president, Mr. Taft.

Mr. McCombs enunciated the sound doctrine that "This is the time of all times when American shipping should be encouraged so that fresh capital would be induced to enter the shipping business."

This latter statement is held to be a direct thrust at the secretary of the treasury, for enactment of the ship purchase bill would prevent investment by private capital in the shipping business. It is contended further, as has been reiterated in resolutions of the National Foreign Trade Council, and other commercial organizations, that unless the navigation laws are materially amended, private capital cannot stand the losses necessary to operation of American ships under the present laws. There is, however, no hope that the administration will seek to amend, much less repeal, the seamen's act. Secretary Redfield has assumed the difficult task of construing the law in the interest of the shipping companies and evidently has tried to make the provisions as liberal as possible, indicating he entertains the opinion that its stringent requirements constitute a tremendous burden.

Mr. Redfield showed that he was annoyed by Mr. McCombs' statement, and immediately aftter it was published made an effort to offset its effect. He did this by stating that American ship yards are working at full speed, and the amount of work now being done in them is unprecedented. He made no reference to the fact that the situation with regard to American ship yards applies also to foreign ship yards, and is due to conditions growing out of the European war. Moreover, it is a fact that some of the vessels being built in this country are for foreign interests and that those which will fly the American flag will do so only until the present abnormal situation ends, when they will transfer their ships to foreign registry.

Speaking of Mr. McCombs' interview, Mr. Redfield said:

"I have no comment to make on the alleged interview with Mr. McCombs other than to express the hope that he has been misquoted."

But Mr. McCombs has not said he was misquoted.

Arguments on Ferro

Washington, Nov. 9.—Arguments against the proposal of railroads to discontinue the import rates on ferro-manganese from the Atlantic seaboard and to apply the domestic rates, which are on a considerably higher basis, were contained in a brief filed last Thursday with the interstate commerce commission. The brief was prepared by G. M. Freer on behalf of the Andrews Steel Co., Newport, Ky.; the United Steel Co., Canton, O.; the Whitaker-Glessner Co., Portsmouth, O., and the American Rolling Mill Co., Middletown, O. The tariffs proposing the increased rates have been suspended until April 29.

Pointing out that ferro-manganese is a desirable traffic on which the present rates are not shown to be unreasonably low, the average loading is said in the brief to be between 29 and 30 tons and the present import rate of $3.62 per ton from Baltimore to Portsmouth, a distance of 520 miles, is declared to yield revenue in excess of 20 cents per loaded car mile, based on the average loading of 29½ miles. The reasonableness of the domestic rates for the application to imported ferro-manganese, it is asserted, cannot be predicated upon the fact that the commission in the 5 per cent advance rate case approved an increase in the domestic rates, since the same stamp of approval was given to the present import rates.

Removal of tariff duty, it is stated, applies to manganese ores as well as to ferro-manganese, and is not a justification for increased rates, the commission having no authority to correct tariff insufficiencies by the freight rate. Abnormal prices and conditions growing out of the European war, it is stated, cannot be accepted as a

basis for determining future rates "and prophecies of post-war conditions are too vague to be entitled to consideration."

It is asserted that there is a competition between the larger steel companies, such as the United States Steel Corporation, producing for their own consumption ferro-manganese made from foreign ore and the relatively small steel concerns now consuming imported ferro-manganese and dependent upon the imported supply.

Foreign Business Men's Visit

Washington, Nov. 9.—Two commissions composed of government officials and business men from European countries are expected to reach the United States within the next few days with the primary purpose of arousing interest in the extension of reciprocal commercial relations. A commission of French business men, under the leadership of the secretary of the budget committee of the French chamber of deputies, is now due in New York with the idea of devoting considerable time to a study of general commercial conditions existing in the United States.

It is expected that the commission will visit the leading cities of the country, not only to study American methods of business, but also to extend the interest of Americans in French products and French markets.

A similar commission, representing the Amsterdam chamber of commerce, is expected to sail from Amsterdam on Nov. 6, reaching the United States about the middle of the month.

Many Seeking New Relations

Washington, Nov. 9.—According to the bureau of foreign and domestic commerce, department of commerce, commercial agents of more than a score of nations are in the United States seeking new trade relations. South and Central American interests are represented, as well as interests situated in Australia, Russia, Italy, Argentina, Spain, India, China, Canada, Japan, South Africa, Bulgaria, New Zealand and Brazil.

There is a wide variety in the classes of goods sought, including machinery, leather, clothing, tools and many other American manufactures. Two visitors from Russia have nearly completed the organization of a co-operative sales agency for promoting Russian interests and their efforts were materially assisted by the bureau. At one of the branch offices, a meeting to launch the project was attended by 50 manufacturers. The visit of the Bulgarian representative last summer was considered an important incident in foreign trade development, as that country has rarely ever made an active canvass for American goods.

Pig Iron Rates

Washington, Nov. 9.—Proposed freight rate increases on pig iron from Virginia furnaces were dealt with at a hearing last Thursday before Examiner Thomas M. Woodward, of the interstate commerce commission. The advances which the railroads have asked for were suspended until April 29 by a recent order of the commission. It is proposed to increase the rail-and-water rate to Boston from $3.05 to $3.17½ per ton, and to make an advance of 5 per cent to the territory lying west of the Harrisburg, Pa.-Sodus Point, N. Y., line, east to Pittsburgh.

Wonderful Gun

The new Maxim machine gun, the first rapid-fire gun of its type ever made in the United States, a product of the recently organized Maxim Munitions Co., New Haven, Ct., was tested in that city last week with results that caused the officers of the company to assert that it is as much in advance of former guns of its type as the automobile of today is superior to that of a decade ago. They declare it is one of the most remarkable pieces of small artillery warfare ever perfected. The new gun is the design of Hudson Maxim, who is a member of the United States naval advisory board, and consulting engineer for the Du Pont Powder Co. It was built in less than 12 days, a new world's record in the construction of a piece of ordnance. It weighs only 90 pounds.

Because of its large orders from the Russian, United States and Mexican governments, the company is negotiating for three more large factories in New Haven and will build them if it cannot acquire them. It will probably manufacture cartridges in addition to the machine gun, as it already has orders for 30,000,000 cartridges. It is expected the company, when fully equipped, will give employment to between 8,000 and 9,000 men.

National Steel Products Co. is about to move its business from Cedar Rapids, Ia., to East Moline, Ill., where it will be housed in the Lee-Fuller building. Operations in the new location will be started by Dec. 1.

Half Billion

Is Estimated Value of Orders to be Placed in Canada

Toronto, Nov. 9.—The Canadian shell committee at Ottawa has been reorganized as the "Canadian munitions committee" under the direct control of the British ministry of munitions. David A. Thomas left Ottawa on Oct. 31, his place as representative of the Imperial government being filled by the appointment of Lionel Hitchens.

In a statement given to the public before his departure, Mr. Thomas reviewed the situation, asserting that the shell committee had done excellent work under the circumstances. The profits of the manufacturers had, in his judgment, been higher than they were entitled, which perhaps was difficult to avoid, but under the new system of competitive tendering, there should be no cause for complaint in this respect in the future. The estimated value of the total war orders either already placed or to be given out was close to $500,000,000, and he believed that public sentiment would be met by the new arrangement placing contracts under the direct control of the British munitions department and by the retirement from the committee of members interested in the manufacture of munitions.

Contracts are now being awarded very gradually, as hundreds of proposals have been received. It is understood that the Canada Cement Co. has secured an order amounting to upwards of $7,000,000 and the Canadian Fairbanks an order for $5,000,000. Other companies stated to be in line for contracts are the Canadian Allis-Chalmers, Canadian Car & Foundry, Canadian Pacific railway, Canadian Vickers Co. and Peter Lyall Co., Montreal; Dominion Iron & Steel, Sydney, N. S.; Nova Scotia Steel & Coal, New Glasgow, N. S.; Steel Co. of Canada, and Hamilton Steel Foundry Co., Hamilton Ont.; Steel & Radiation, Ltd., John Inglis Co., Canadian General Electric Co., and Canadian Northern railway, Toronto; Taylor, Forbes & Co., Galt; Ingersoll-Rand Co. and Jenckes Machine Co., Sherbrooke, Quebec.

William Marshall, consulting engineer of Toronto, one of the inventors of the Marshall-Weden machine gun has sold to the St. Louis Car Co. the right to manufacture the gun in the United States. It is stated that he will receive about $30,000,000 in commissions on a large order from the French and Russian governments. Mr. Marshall says that this statement is substantially correct.

Iron and Money: Fact and Comment

Rumors of Peace Have Depressing Effect on War Stocks—Interesting Features Described by President DuPuy of Crucible Steel Co. of America

UNDER the leadership of Bethlehem Steel, which declined 79¾ points, there was a general march downward of industrial stocks last week, with some exceptions. This slump seemed to be due largely to rumors of peace, which have not proved to be well authenticated. Indications of sound business improvement have not been lacking, as, for example, in the report of business failures. For the week ending Friday, last, failures were 359, against 381 the week before and 412 in the first week of November last year. New York City banks last week expanded loans by $59,600,000. Half a million dollars in gold left New York for Amsterdam, as the result of German selling through Holland. Owing to the selling of securities, Dutch exchange has been kept at a premium when exchange with other foreign countries was at a discount.

The market Monday was clearly influenced by cables predicting that the buying of foreign nations would not be in as large volume hereafter. Nothing has transpired to show that there was any real foundation for these reports. The New York Central and the Pennsylvania systems reported net increases in earnings.

Tuesday being election day, there was no trading on the stock exchange.

While the general trend of election news was favorable to the Republicans, many of the elections were so complicated by local issues that neither of the great parties could claim very much. Bethlehem Steel was again the leader Wednesday in the downward movement. Motors and coppers also declined, but railroads were strong, as were some other industrial stocks. There was heavy trading in bonds.

The trend of prices Thursday was somewhat stronger. There was a demand for railroad shares. Although there was little or no peace talk, the selling of war shares continued and the bulls still had the dominant influence in the market.

There was more peace talk Friday and the general tendency was downward, but the hopeful interview of Judge Lovett was encouraging. The news on Saturday morning was for the most part unfavorable to war stocks and moderate declines for most of them were recorded.

Quotations at the close of business Nov. 6 and changes in the leading stocks identified with the iron and steel industry for the week are shown in the following table:

	Close Nov. 6.	Net change.
American Can	58½	—3½
American Can, prfd.	106½	— ¾
Amer. Car & Fdy. Co.	83	—4½
Amer. Car & Fdy. Co., prf.	116¾	— ⅜
American Locomotive	65⅞	—4⅝
American Locomotive, prf.	99	— ⅛
American Steel Foundries	60¼	—8⅝
Baldwin Locomotive	123½	—11
Baldwin Locomotive, prfd.	109	—1½
Bethlehem Steel	435	—79¾
Bethlehem Steel, prfd.	165	—3
Colorado Fuel & Iron	54	—4
Continental Can	94	—5¾
Crucible Steel	74¼	—10¼
Crucible Steel, prfd.	106	—1½
General Electric	177⅞	—4⅛
International Harv. of N. J.	111	+ ¼
Inter. Harv. of N. J., prfd.	120	+3
International Harv. Corp.	70	+2
Lackawanna Steel	74¼	—9¾
Nat'l Enam. & Stamp. Co.	30	—4
Nat'l En. & Stamp. Co., prf.	92	+1
Pressed Steel Car	67⅞	—4¼
Pressed Steel Car, prfd.	103⅝	—2¼
Pullman Palace Car	167	—1
Republic Iron & Steel	50⅞	—3⅜
Republic Iron & Steel, prfd.	105	+1
U. S. Cast Iron Pipe & Fdy.	28	—2⅜
U. S. C. I. P. & Fdy., prfd.	54	+1½
United States Steel	86	—2
United States Steel, prfd.	115½	—1⅜
Westinghouse Mfg.	69	—3¾

The following table shows changes in maximum quotations of stocks not listed on the New York stock exchange:

	High Nov. 5.	High Oct. 29.
American Radiator	360	360
American Ship Building	43	40
Cambria Steel	67⅝	69¼
Chicago Pneumatic Tool	87⅜	87½
Inland Steel	....	....
LaBelle Iron Works	59½	58
Lake Superior Corpn.	11¼	9⅞
Pennsylvania Steel	85	100
Stewart-Warner Speed. Co.	75⅝	76⅛
Warwick Iron & Steel Co.	10¾	10¾
Westinghouse Air Brake	142	143¾
Westingh'se Elec. & Mfg. Co.	72½	74½

Crucible Steel Earnings

The Crucible Steel Co. of America reports net profits of $3,073,750 for the fiscal year ended Aug. 31, 1915, as compared with net profits of $1,015,039, and a deficit after dividends of about $735,000 for the preceding fiscal year. Gross profits for the last fiscal year totaled $5,220,921, as compared with $2,991,602 the fiscal year ending Aug. 31, 1914. The income account compares as follows:

	1915	1914
Gross profits	$5,220,921	$2,991,602
Interest, depcn., etc.	2,147,171	1,976,563
Net profits	3,073,750	1,015,039
Previous surplus	7,371,202	8,106,163
Total surplus	10,444,951	7,371,202

The report of the board of directors, signed by Herbert DuPuy, chairman, and C. C. Ramsey, president, offers a number of interesting market features. A change for the better in market conditions suddenly presented itself the early part of the year, when foreign countries entered the market for products of the Crucible Steel Co., it is stated. The scarcity of tungsten, obtained from wolfram ore, has tended to create abnormally high prices for high speed tool steel, one of the commodities manufactured by the Crucible company. Much of this ore formerly entered this country through the port of Hamburg, Germany, now blocked. Great Britain placed an absolute embargo upon this material from England and her colonies, which control 50 per cent of the output of the world.

In order to furnish war material for the United States government and to accept outside orders, directors provided a $3,000,000 extension to the plant at Atha, Mass. For the first time since the outbreak of the European war, definite advice concerning the extent of war orders taken by the company, is offered in the annual report, which says that contracts covering all descriptions of steel intended for munitions for foreign countries, amount in value in excess of $17,000,000, about 50 per cent of which has been sold to domestic manufacturers. About one-half of the material involved will have been shipped by Jan. 1, 1916. Aside from business of this character, the company has not taken much tonnage for export.

Improvements contemplated for the Crescent plant were stopped during the dull period of the year and nothing but the machine shop was erected. The program of improvements, however, probably will be carried out this year. Two additional 90-ton acid open hearth furnaces have been added to the plant of the Pittsburgh Crucible Steel Co. at Midland, Pa., which now contains six basic and four acid open hearth furnaces, all of equal capacity. The Midland blast furnace, which was re-lined, is producing about 500 tons of pig iron a day. An auxiliary 28-inch billet mill was provided to take care of the increased output of the open hearth furnaces and to relieve pressure on the 40-inch blooming mill. The company has erected a number of additional houses for use of superintendents and others at Midland.

Many Workers Are Loafing

While War Rages—Great Loss of Time in English Workships—Pig Iron Market Stronger

Office of *The Iron Trade Review*,
Prince's Chambers, Corporation St.,
Birmingham, Eng., Nov. 2.

Although Germany is doing her worst to make our flesh creep by her threats of tremendous developments in the Balkans, the farcical nature of this enterprise is becoming increasingly evident. We have been delighted this week by news of Russian triumphs following each other day after day, in a way which shows that our eastern ally is still full of fight, and compelling the enemy to put the last ounce of energy into his defence. During the past few days, matters have been notably quiet on the western front, Germany apparently having now given up as hopeless all efforts to recover lost ground. The new recruiting campaign has met with astonishing success, both in London and Birmingham, and there are evidences that the voluntary system is not yet played out, and that hundreds of thousands of men can still be obtained to fill up the gaps abroad.

The most disheartening circumstance is the great loss of time among workmen in various positions. In a recent prosecution at Birkenhead instituted by Cammell Laird & Co., it was stated that out of 11,000 men nearly 4,000 lost a quarter on Monday, while 1,400 did not put in an appearance. On Tuesday, Wednesday and Thursday, over 2,000 men each morning had lost a quarter and over 1,000 failed to appear. This happens to be a controlled firm, and the output of this concern has a direct relation with the battlefield. This is a sample of what is going on in many factories.

Pig Iron

After being many months in the doldrums, pig iron appears to be recovering once more, and the pig iron makers of Birmingham yesterday had the rare luxury of quoting and getting higher prices. It seems to be a case of the worm turning. There appeared to be no limit to the compliance of the smelters with the demands of buyers of all classes. But the recent advance in wages and materials imposed a stern limit, and at last the makers stopped all further concessions. It is now evident from the strength of the buying movement that consumers had already reached the danger line in their contracts, and the new orders are being accompanied by the most urgent demand for prompt delivery. In the Cleveland district, prices have advanced about 1s 8d (40c) on the week. There is some decrease also in stocks, while moderate shipments are being made. The loadings to date are 31,000 tons, which have so far been the best of the year up to this period of the month. The amount in store is 134,000 tons. On the Midland market the recoveries of this and last week amount to 2s 6d (60c) per ton with a decided upward tendency. The strong position of the steel trade has given a stimulus to hematite, which on the week has advanced 5s ($1.20) as a minimum, while some producers ask 7s 6d ($1.80) advance.

Finished Iron and Steel

The demand for every description of material was never so great as it is at the present time. In spite of the great difficulty of getting deliveries, consumers are eager to have their orders accepted, and this desire has been stimulated by the special activities of the government during the past week, in securing preferential treatment for war demands. Important conferences have taken place between steel workers and representatives of the British and French governments with a view to increasing the supply of steel for war purposes and meeting the growing demand for shell material. One large firm alone in South Wales has undertaken to furnish from 3,000 to 4,000 tons of steel weekly for this purpose, a large part of which will go to the French factories. One effect of this activity was the withdrawal on the Birmingham market yesterday of all quotations and undertakings in regard to private consumers. The users of billets are becoming very greatly concerned as to their prospects for the coming winter and spring. A few bessemer billets were to be had at about £8 5s, but open hearth steel was not to be had at any price. American supplies are greatly reduced, and the contracts working out are not being renewed or replaced.

Program for Engineers' Meetings

Elmer K. Hiles, secretary of the Engineers' Society of Western Pennsylvania, announces the following program: Nov. 9, a paper on "Highway Bridge Floors," by Charles M. Spofford, professor of civil engineering, Massachusetts Institute of Technology; Nov. 16, "Improvements in the Art of Mechanical Filtration," by Thomas Fleming Jr., sanitary engineer, Chester & Fleming, Pittsburgh; Nov. 23, "Some Mechanical Analogies in Electricity and Magnetism," by Dr. W. S. Franklin, formerly professor of physics, Lehigh University; Dec. 7, "Utilization of Iron and Steel Works Slag", by E. C. Brown, chief civil engineer, Carnegie Steel Co., Pittsburgh; Jan. 4, "The Relations Between Engineers and Contractors," by James W. Rollins, president, Holbrook, Cabot & Rollins Corporation, engineers and contractors, Boston; Jan. 18, presidential address—"Some Details Often Neglected by Engineers," by A. Stucki, consulting engineer, Pittsburgh.

Motor Trucks

Not Being Exported in as Large Numbers—Foreign Commerce

Some additional details are now available in regard to foreign commerce for August. The shipment of motor trucks has shown a sharp decrease in July and August as compared with June, the value of the shipments for August being about half that of the shipments for June. The value of the metal working machinery exported shows only a slight decrease. An interesting development is the rapid increase in the value of shipments of agricultural implements, as shown in the accompanying table. The total value of machinery exports for August, 1915, was $11,439,391, as compared with $4,759,707 in August, 1915. Exports and manufactures of iron and steel amounted to $37,726,822 in August, 1915, and $10,428,817 in August, 1914.

Exports of zinc, except ore and dross, continue to increase.

FOREIGN COMMERCE.

1915.	Motor trucks.	Agricultural implements.	Aeroplanes.	Metal working machinery.
Jan.	$2,545,527	$429,745	$71,315	$2,903,740
Feb.	3,022,482	762,606	6,000	2,523,722
March	4,725,563	1,567,327	89,450	3,863,913
April	5,240,481	1,534,715	318,492	3,300,953
May	6,583,912	1,711,379	83,950	3,762,567
June	8,578,802	854,670	283,212	3,735,562
July	6,803,001	963,534	880,836	3,872,358
Aug.	4,387,193	1,454,606	588,600	3,624,411

IRON ORE IMPORTS.

	August,		Eight months ending August,	
	1915.	1914.	1915.	1914.
Spain	5,938	14,869	32,946	40,929
Sweden ...	27,387	18,248	147,694	240,937
Canada ...	12,038	8,894	16,167	29,147
Newfoundl'd & Labrador		6,500	.....	27,515
Cuba	68,743	77,980	501,588	565,543
Oth. coun..	12,700	8,422	99,450	81,725
Total	126,806	134,913	797,845	985,796

Munition Makers Lead Tool Market

Midvale Steel Co. Buys Heavily—New Ordnance Concern Organizing—Baltimore & Ohio Railroad to Put Out Inquiry—Plant Extensions Numerous

THE largest single buyer of machine tools during the past week or 10 days has been the Midvale Steel Co., Philadelphia. This concern, in line with the policy laid out by the new management, has placed exceedingly large orders for equipment, but the details are not yet available. It is likely that the Midvale company will again enter the market on a large scale. A development of considerable interest to the machine tool trade is the preliminary drafting of plans for the organization of another munitions concern, which is to have a capital in the neighborhood of $50,000,000. Among those interested in the prospective concern is Wm. R. Brown, a former Connecticut state senator and for several years an official of the Remington Arms Co. It is understood the preliminary plans of this company call for the erection of four plants.

Domestic buying of machine tools continues to show activity. Among important buyers during the past week have been some of the car manufacturing concerns which of late have received equipment orders from various railroads. The Baltimore Car & Foundry Co., the Standard Steel Car Co., the Pressed Steel Car Co., the American Car & Foundry Co. and other concerns in this line all have placed important orders for new equipment.

Scattered Inquiries from Railroads

No new railroad buying of importance is reported, but there came out from the railroads during the week a number of scattered inquiries for machine tools which total a considerable amount of business. Among eastern railroads, probably the biggest prospective buyer of machine tools is the Baltimore & Ohio. This interest for some time past has had plans under consideration for shop improvements and it is considered likely that definite action will be taken in the near future. Several of the automobile manufacturers who have been heavy buyers of late, have placed further good-sized requirements.

The McMyler Interstate Co. has taken a contract for two stationary revolving cranes, having capacities of 10 and 20 tons, respectively, for the Wm. Cramp & Sons Ship & Engine Building Co. This concern also took an order for a 120-ton crane of the same type for the Harlan & Hollingsworth Corporation. The Morgan Engineering Co. has taken an order for another 10-ton crane for the Broken Hill Proprietaries Co., New South Wales.

Among eastern concerns who are extending their capacity are the Unique Brass Foundry, Buffalo; the New England Westinghouse Co., Meriden, Ct.; Empire Repair & Electric Welding Co., Brooklyn; Victor Typewriter Co., Poughkeepsie, N. Y.; Phoenix Fire Extinguisher Co., Norwich, Ct.; Contractors' Plant Mfg. Co., Buffalo; Automatic Transportation Co., Buffalo; Bridgeport Brass Co., Bridgeport, Ct.; Fayette R. Plumb, Inc., Philadelphia; Jones & Lamson Machine Co., Springfield, Vt.; Hunt-Spiller Mfg. Corporation, Boston; Bathroom Equipment Mfg. Co., Hyde Park, Mass.; Standard Mfg. Co., Bridgeport, Ct.; American Abrasive Co., Irvington, N. J.; Simms Magneto Co., East Orange, N. J.; the Morrison Foundry Co., Newark, N. J., and others.

Chicago Market Quiet

Machine tool markets have settled into a steady condition, the hysteria of earlier months disappearing. Demand is still far in excess of supply, both for second-hand and new tools. Labor troubles have delayed deliveries considerably and complicated the situation. A Chicago dealer recently bought the equipment of the Calumet Machine Co., including 37 tools, the larger portion of which has been sold.

A further advance in price has gone into effect, making the total increase on several lines about 42 per cent over rates prevailing before the war. Demand from domestic sources is increasing and the volume of this business is much larger than a year ago.

Domestic Business Leading

Increasing activity of domestic buyers is the principal feature of the Pittsburgh machine tool market. While western Pennsylvania railroads are not inquiring for equipment, except in a tentative way, it is understood the Pennsylvania railroad is preparing a list of miscellaneous types of tools for its shops at Altoona, Pa. The American Sheet & Tin Plate Co., which will build a new plant at Gary, Ind., will put out inquiries soon on machine tools and rolling mill equipment. The McClintic-Marshall Co. has let contracts for 28 Shaw traveling and hoisting cranes and for a large number of punches and shears for extensions to its plant at Pottstown, Pa.

Among central western concerns extending plant capacities are the Franklin Corrugating Co., Franklin, Pa.; the Pittsburgh Steel Products Co., Monessen, Pa.; the Pittsburgh Tool & Steel Wire Co., Monaca, Pa., and the Canton Steel Foundry Co., Canton, O.

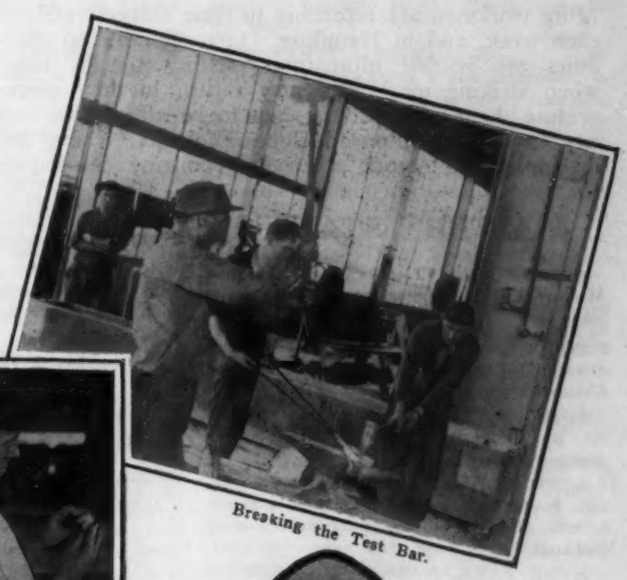
Cleveland Market Steady

The machine tool market in Cleveland reflects the same conditions that exist elsewhere. The shortage of tools, particularly those adapted to the manufacture of shrapnel, retards the market. Demand is strong for all machines, and it is by no means limited to tools for munition-making. There is a decided tendency on the part of builders to seek domestic business, and dealers report that the market, without regard to foreign demand, is better than in several years past. The Oliver Machinery Co., Grand Rapids, Mich., has been awarded several contracts for machine tools by foreign governments. The Cleveland Machinery & Supply Co. has been awarded a contract by the Chester Engineering & Ordnance Co., Chester, Pa., for 330 tools.

Strikers are Capitulating

The strike of union machinists in Cincinnati, which for a time threatened to seriously handicap the machine tool industry, is beginning to turn in favor of the manufacturers. All of the 38 shops affected are operating, although shipments are falling behind.

Pouring a Test Bar.



Breaking the Test Bar.

Examining the Structure.

Controlling the Quality of the Steel

All guesswork is eliminated in the making of Agathon Steels.

The quality is controlled by facts. The analysis is constantly sampled. Test bars are frequently poured during the preparation of every heat. These test bars are broken and the fracture carefully examined. When the *eye* has been satisfied, the bar is rushed to the *laboratory* where samples are drilled and subjected to minute *chemical analysis*.

AGATHON STEELS

"AGATHON" Chrome Nickel
"AGATHON" Chrome Steel
"AGATHON" Chrome Vanadium
"AGATHON" Nickel Steel
"AGATHON" Special Analyses
"AGATHON" Vanadium
"AGATHON" Silico-Manganese
"AGATHON" High Carbon

THE CENTRAL STEEL COMPANY

MASSILLON, OHIO

Detroit Office: 326-27-28 Ford Bldg., F. Walter Guibert, District Representative
Cleveland Office: Hickox Bldg. - The Hamill-Hickox Co., District Representative

More workmen are returning to their respective shops each week, and in Hamilton, O., machine shop operators are issuing ultimatums, setting specific dates when striking machinists may return to their places or lose them. The latest shop to be affected in that city is the Hamilton Machine Tool Co., where 200 machinists quit work when the company refused to comply with their demands. The plant of the Davis Sewing Machine Co., Dayton, O., one of the largest of its kind in the middle west, has been purchased by Blair & Co., of New York, the latter firm having contracts for war orders. The East Iron & Machine Co., Lima, O., has been awarded a contract for cartridges, amounting to about $2,500,000.

EASTERN STATES

SPRINGFIELD, VT.—The Jones & Lamson Machine Co. is building an addition to its plant.

BOSTON. — Fire damaged the carriage factory of Chauncey Thomas & Co., Inc., on Chestnut street.

BOSTON.—The aeroplane testing plant of the B. F. Sturtevant Co. at Readville was damaged by fire.

BOSTON.—The Hunt, Spiller Mfg. Corporation, South Boston, has been granted a permit to make alterations to one of its manufacturing buildings.

HYDE PARK, MASS. — The Bathroom Equipment Mfg. Co., Walters street, plans the erection of a brick dry kiln.

BRIDGEPORT, CT.—The Bridgeport Brass Co. has let contract for a rolling mill addition.

BRIDGEPORT, CT.—The American Graphophone Co. has let a contract for a 5-story, 60 x 325-foot factory.

BRIDGEPORT, CT. — Another large concern for the manufacture of war munitions is being organized here. The capitalization, it is reported, will be approximately $50,000,000. Four plants will be erected, one in Bridgeport, two in Providence, and one either in Waterbury or Hartford.

BRIDGEPORT, CT. — The Standard Mfg. Co. is about to start work on a 3-story brick factory building, 65 x 120 feet. This company has decided to abandon its structural steel business and devote its entire capacity to manufacturing tools and machinery. Its structural steel business has been sold to the A. J. Leake Erecting Co., which is building a plant near the Standard plant.

MERIDEN, CT. — The New England Westinghouse Co. has awarded contracts for the erection of two 1-story brick and steel factory buildings, 80 x 200 and 80 x 100 feet, respectively, to be erected just north of the company's present plant.

NORWICH, CT.—The Phoenix Fire Extinguisher Co. has begun work on a 2-story, 32 x 62-foot factory building.

PORTLAND, CT.—The Portland Specialty Co. has received orders from the Maxim Silencer Co., which will require the employment by the former company of about double the present number of employes.

TORRINGTON, CT. — The Coe Brass branch of the American Brass Co. has awarded the contract for the erection of new 1-story brick and steel rod mill, 220 x 240 feet.

WATERBURY, CT.—The additions which the Scoville Mfg. Co. is building will cost approximately $2,000,000. The company is manufacturing shrapnel caps, fuses and other munitions.

BROOKLYN, N. Y.—The ush Terminal Co., 100 Broad street, New York, will start work immediately on a 1-story, 73 x 90-foot factory building here.

BROOKLYN, N. Y.—The Empire Repair & Electric Welding Co., foot of Twenty-sixth street, has let the contract for the construction of a new 1-story repair shop.

BUFFALO. — Contractors' Plant Mfg. Co., Erie street, has let a contract for a 1-story, 57 x 129-foot machine shop.

BUFFALO.—The Automatic Transportation Co., Main street and Erie railroad, will build an addition to its plant.

BUFFALO.—The Ferguson Steel & Iron Co. is considering plans for an addition to its plant.

BUFFALO. — The Unique Brass Foundry Co. will erect a 50 x 100-foot foundry and a 36 x 85-foot machine shop. Bids will be received by E. C. Haas, Buffalo.

JAMESTOWN, N. Y.—U. G. Lyons, president of the Conewango Refining Co. has taken an option on 40 acres of property in North Warren, and plans the erection of a refining plant.

NEW YORK.—T. E. Hergert, 422-430 East Fifty-third street, will award contract for a 1-story factory addition.

POUGHKEEPSIE, N. Y. — The Victor Typewriter Co. is having plans prepared by John J. Petit, architect, 103 Park avenue, New York for a 4-story and basement, 75 x 350-foot factory building.

SYRACUSE, N. Y.—Hotaling & Warner, 720 North Clinton street, has begun work on a 3-story, 63 x 98-foot factory addition.

BEN AVON, PA. — The Hamilton Motor Co., capital stock $7,500, has been incorporated by Robert Hamilton, Elizabeth A. Hamilton, William L. Hamilton and John L. McBride, of Ben Avon.

BUTLER, PA.—The Standard Plate Glass Co. is erecting an addition, 158 x 200 feet, to its grinding and polishing shed. Electric cranes and glass working equipment will be installed.

FRANKLIN, PA.—The Franklin Corrugating Co. has taken over the manufacture of sheet metal, formerly conducted by F. J. Pritchard. A new plant will be erected.

LEBANON, PA.—The erecting and pattern shops of the Weimer Machine Works were damaged by fire. The loss is estimated at $100,000.

PENN, PA. — The William Penn Rubber Co., capital stock $5,000, has been incorporated by E. E. Gillup, Herbert A. Patterson of Wilkinsburg and Robert F. Bradburn, Pittsburgh.

PHILADELPHIA.—Fayette R. Plumb, Inc., Tucker and James streets, has let a contract for a 1-story, 44 x 144-foot machine shop.

PHILADELPHIA. — Charles Warner Co., Land Title building, will build a lime kiln and bagging building, 1-story, 50 x 140 feet, at Cedar Hollow, Pa.

PITTSBURGH.—The Painter-Dunn Co. will build a 100 x 150-foot 2-story garage and storage building, to cost about $15,000.

PITTSBURGH. — The Pittsburgh Tool & Steel Wire Co. will build an addition to its plant at Monaca, Pa.

PITTSBURGH. — W. S. Raw has been awarded the general contract for a steel highway bridge, involving 300 tons of steel at Lyons Falls, N. Y.

PITTSBURGH. — The Franklin, Pittsburgh Automobile Co., capital stock $25,000, has been incorporated by R. S. Suydan, W. W. Murray Carr, J. M. Booker and A. R. Gribben, all of Pittsburgh.

PITTSBURGH. — The Pittsburgh Steel Products Co., with works at Monessen, Pa., will erect an addition to its plant, contracts for which have been placed.

PITTSBURGH.—The Guarantee Chemical Co., capital stock $6,000, has been incorporated by A. L. Dough, W. H. Oetting and C. C. Weiss, all of Pittsburgh.

PITTSBURGH. — Proposals for furnishing and delivering service bridge and Poiree trestles at Dam No. 10, Ohio river, are being received by United States engineers, Farmers' Bank building.

PITTSBURGH. — The Andrews-Bradshaw Co. has been incorporated; $5,000 capital stock; by Grant D. Bradshaw, Johnstown, Pa., Roger W. Andrews and W. E. Hirt, Erie, Pa.

POTTSTOWN, PA.—The McClintic-Marshall Co. is about ready to place a contract for 20 or more cranes, for its plant at Pottstown.

READING, PA.—The Sullivan Needle Co. has been incorporated; $5,000 capital stock; by William B. Sullivan, Pittsburgh, John E. Sullivan, Reading, C. H. Bagshawn and Walter J. Bagshaw, Lowell, Mass.

SPRING CITY, PA.—Spring City, Chester and Montgomery counties contemplate the erection of a bridge over Schuylkill river.

UNIONTOWN, PA.—Harvey & Washington have been awarded a contract for the erection of a bridge over Jacobs creek at West Averton.

WILKINSBURG, PA.—Struble Bros., Inc., capital stock $10,000, has been incorporated by J. N. Struble, 1119 Rose avenue, by Howard F. Struble and C. L. Struble, to manufacture steam fittings and galvanized products

YORK, PA.—R. B. Willis, 10 Market street, is the architect for the new county house, to be of fireproof construction. The estimated cost is $500,000.

ASBURY PARK, N. J.—Weeden, Havens & Weeden Co. will rebuild its machine shop, carriage factory and garage recently damaged by fire.

ASBURY PARK, N. J.—The Lehritter-Johnson Co. has been incorporated to manufacture chemicals; $25,000 capital stock; by G. V. Johnson, C. E. Jenkinson, Highland, N. J., and J. B. Lehritter and William P. McMichael, Asbury, Park.

BLOOMFIELD, N. J.—The International Arms & Fuse Co., New York, has had plans prepared for 123 x 600-foot addition to cost about $110,000. The structure will be similar to buildings nearing completion.

BOONTON, N. J.—The Central Machine & Supply Co., 48 Chambers street, New York, N. Y., has leased the plant of the Boonton Electric Co. and will install machinery for the manufacture of automobile parts.

CAMDEN, N. J. — The Pennsgrove Construction Co. has been incorporated to engage in general construction; $25,000 capital stock; by King A. Porter, Samuel A. Smith, W. H.

Beegle, Ocean City, N. J., and Ferd A. Doty, Pennsgrove, N. J.

CAMDEN, N. J.—The New York Ship Building Co. has been awarded a contract for six colliers for the Coastwise Transportation Co. The estimated cost of each vessel is $750,000.

EAST ORANGE, N. J.—The Simms Magneto Co. will start work in a few days on two additions, to cost $10,000 and $5,000, respectively.

ELIZABETHPORT, N. J.—Samuel Moore & Sons Corporation is expected to close shortly on equipment for its new shipbuilding plant.

ELIZABETH, N. J.—The Metals Plating Co., 200 Fifth avenue, New York, plans the erection of a plant to be 40 x 236 feet. The company uses a patented process for coating steel plates.

GLEN RIDGE, N. J. — The Rose Metal Products Co. has been incorporated to manufacture chemical products; $50,000 capital stock; by D. A. Shirk and R. E. Myers, East Orange, N. J., and Harry D. King, Glen Ridge.

HARRISON, N. J.—The Hyatt Roller Bearing Co. has let a contract for an 8-story, 75 x 200-foot manufacturing building.

HOBOKEN, N. J.—The Remington Arms Co., Bridgeport, Ct., has finished negotiations with the Hoboken Land & Improvement Co., for leasing of the terminal factory buildings at Fifteenth and Hudson streets.

IRVINGTON, N. J. — American Abrasive Co., 46 Coit street, is erecting a $10,000 foundry.

IRVINGTON, N. J.—The Lionel Mfg. Co. has had plans prepared and will start work shortly on the erection of 2-story, 228 x 235-foot factory.

JERSEY CITY, N. J.—The plant of the New Jersey Car Spring & Rubber Co., was damaged by fire.

JERSEY CITY, N. J.—The Berryman Water Heater Mfg. Co., has been incorporated to manufacture heaters, etc.; $20,000 capital stock; by A. L. Wannerston, Brooklyn, N. Y.; J. T. Booth, New York, and L. V. Hulse, Hoboken, N. J.

KENILWORTH, N. J.—The munition plant of the American Can Co. is being completed and is expected to be ready for occupancy in December.

NEWARK, N. J.—Charles Cooper & Co. are erecting a 1-story brick factory building, 50 x 125 feet.

NEWARK, N. J.—The Continuous Casting Corporation, which manufactures a machine for casting brass tubing, is in the market for a lathe for its plant at Garwood, N. J.

NEWARK, N. J.—The Morrison Foundry Co., 109 Gothart street, has been granted a permit for the erection of a 1-story, steel and brick shipping room.

NEWARK, N. J.—A. Hollander & Sons have purchased a 2-story factory building on Railroad avenue and will equip it for the purpose of dyeing skins.

NEWARK, N. J.—The George A. Fuller Co., New York, N. Y., will erect a hotel on Park place for the Newark Hotel Investment Co. The estimated cost of construction is $472,000.

NEWARK, N. J.—G. T. Casebolt, 1005 Broad street, has plans in progress for a 3-story machine shop, garage and auto sales room, which will be leased to J. W. Mason, 350 Halsey street.

NEWARK, N. J.—Carl Schoenert & Sons, Inc., has been incorporated to manufacture tools; $50,000 capital stock; by Carl Schoenert, William Schoenert, Newark, and Charles Schoenert Jr., Irvington.

NEWARK, N. J.—The Granville Chemical Co. has been incorporated to manufacture dyes, chemicals, etc.; $125,000 capital stock; by Belville G. Granville, Newark, B. E. Wright, Orange, and Wesley Wright, East Orange, N. J.

PARLIN, N. J.—The International Smokeless Powder & Chemical Co. has sold its plant to the Du Pont Powder Co.

PAULSBORO, N. J.—Equipment is being installed in the new plant of the American Ammunition Co., and operations are expected to start shortly.

PERTH AMBOY, N. J.—Nelson & Landsberg, New York, plan to erect a plant to cost about $20,000.

PERTH AMBOY, N. J.—The Pratt-Brown Co. plans erection of a 4-story factory building at Smith street and Madison avenue.

PERTH AMBOY, N. J.—The Co-operative Glue & Chemical Co. has purchased a site and will erect a factory. The company is capitalized at $90,000.

PERTH AMBOY, N. J. — The Raritan Copper Works will erect a tile and steel 112 x 210-foot addition. The estimated cost of construction is about $57,000.

PLAINFIELD, N. J. — The International Motor Co. has been awarded a contract for 700 motor trucks by the Russian government.

TOMS RIVER, N. J.—The Ocean County Electric Co. has been incorporated to build a power plant; $525,000 capital stock; by John P. Murray, Leighton P. Stradley, Philadelphia, Pa., and F. Stanley Saurman, Churchville, Pa.

TRENTON, N. J.—The United Globe & Rubber Co. contemplates the erection of an addition to its plant.

TRENTON, N. J.—The state of New Jersey plans the erection of a chemical laboratory estimated to cost $32,000.

TRENTON, N. J.—The John E. Thorpp & Sons Co. will build a brick and steel addition to the Lewis street plant. The estimated cost of construction is about $8,000.

WOODBURY, N. J.—The Repaupo Powder Works, at Gibbstown, has been sold to the E. I. duPont de Nemours & Co. The plant is valued at $400,000.

DOVER, DEL. — The Pittsburgh Pressed Metal Co., Wilmington, Del., capital stock $250,000, has been incorporated by Herbert E. Latter, Norman P. Coffin and Clement M. Enger, all of Wilmington, to take over contracts for the manufacture and delivery of 1,555,000 sets of time rings intended for use in the manufacture of shells.

WOODBERRY, MD. — Poole Engineering Co. has let contracts for a 1-story factory addition to cost approximately $150,000.

WASHINGTON, D. C.—The bureau of supplies and accounts, navy department, will receive bids until Nov. 23 for a motor and hoisting and controlling apparatus for the Philadelphia navy yard, till Nov. 30 for seven aeroplane motors to be delivered at Pensacola and Washington.

CENTRAL STATES

CANTON, O.—The Canton Steel Foundry is increasing its capacity by the installation of two core and two drying ovens, a gas engine and electrical equipment.

CINCINNATI.—Fire which started in the core department of the Bollman-Wilson Foundry Co. caused a small amount of damage.

CINCINNATI.—The Gordon Machine Co. has been incorporated; capital stock, $10,000; by Fred Thomas, L. A. Hauck and M. Mitchell.

CINCINNATI.—The Knabe Bros. Co., piano manufacturer, has added a new department to its plant to manufacture a talking machine. A small amount of special machinery will be needed.

CINCINNATI.—The Cincinnati Ball Crank Co. will build a 1-story addition to its plant in Oakley to cost about $14,000. Plans are being prepared and estimates will be received shortly. New equipment will be needed.

CINCINNATI. — The Cincinnati Bickford Tool Co. has applied for a permit to build an addition to its plant in Oakley to cost $4,000 and to be used as a pattern shop. This is the sixth machine tool shop in Cincinnati to enlarge its facilities within the past four months.

CINCINNATI.—The Proctor & Gamble Co., with headquarters in Cincinnati, has let contracts for the following buildings to be built at Selma, Ala.; a cotton oil mill, 45 x 135 feet; an engine and boiler room for three boilers; a steel warehouse, 75 x 200 feet. The cost will be $40,000. The Virginia Steel & Iron Co. has secured part of the contract for construction.

DAYTON, O.—The capacity of the Davis Sewing Machine Co. will be doubled in the next ten months. The company was recently purchased by Blair & Co., of New York, and has been awarded several large contracts. The plant is equipped to make all kinds of sewing machines, drill presses and screw machines.

EAST LIVERPOOL, O. — The National Drawn Steel Co. has increased its capital stock from $100,000 to $150,000. It is planned to double the capacity of the plant.

FINDLAY.—The Grant Motor Co. will add a new service building and two warehouses to its plant, giving an additional 25,000 square feet of floor space to its facilities.

IRONTON, O. — The Standard Slag Co. plans to build a plant at Jackson, O.

LIMA, O.—The East Iron & Machine Co. has purchased a 13-acre tract and will erect an addition to its factory. The company, which manufacures asphalt machinery, has secured an order for munitions.

LIMA, O.—The Chicago Hamilton & Dayton railroad has had plans prepared for a $23,000 power plant to be erected at Lima. H. B. Foorhees is general superintendent with offices in Cincinnati.

LORAIN, O.—The directors of the Hoffman Heater Co. have authorized an increase in capital stock from $100,000 to $200,000 and are considering the erection of additional buildings.

YOUNGSTOWN, O. — The Pittsburgh & Lake Erie railroad plans to build a repair shop near Youngstown.

PEACH TREE, W. VA.—The Chesapeake & Ohio railroad, with general offices at Richmond, Va., will erect a 6-stall round house. F. I. Cabell is chief engineer.

WHEELING, W. VA.—The Wheeling Motor Car Co. will build a factory. G. M. Ford is interested.

WHEELING, W. VA.—S. R. Dawson will build a plant for the manufacture of wrapping machines at Huntington.

LEXINGTON, KY.—The Love Machinery Co., 519 West Main street, will establish a foundry to manufacture lathe castings. James Love is president.

ANDERSON, IND.—E. R. Watkins, architect, 440 Union Block, will receive bids soon

for a factory, 36 x 116 feet, for The Pierce Speed Controller Co.

ANDERSON, IND.—The Reliable Machine Co. has been incorporated to manufacture machinery $10,000 capital stock; by Charles Martindale, Charles H. Warlings and Sam Maag.

BICKNELL, IND.—Equipment has been purchased by the Bicknell Light & Power Co. for the $1,000,000 plant that is being erected at Apraw Ferry. This plant will have a capacity of transmitting power over a radius of 100 miles.

EVANSVILLE, IND.—A portion of the plant of the International Iron & Steel Construction Co. was damaged by $25,000 fire.

EVANSVILLE, IND.—The Evansville Tool Works has been awarded a contract by the Russian government for tools. This order includes hatchets, hammers, blacksmiths' supplies, axes and sledges.

HAMMOND, IND. — The plant of the American Steel Foundries Co., East Chicago, will be enlarged. A 200 x 320-foot structure will be erected.

HAMMOND, IND. — The Standard Steel Forging Co. plans the erection of three steel additions to its present plant. The estimated cost of construction is about $100,000.

HAMMOND, IND.—The American Sheet & Tin Plate Co. has awarded the A. F. Hartigan & Co., East Chicago, Ind., a contract for preliminary work on its new building. This addition will be 880 x 2,000 feet.

HEBRON, IND.—The Hebron Heat, Light & Power Co. has been incorporated; capital $25,000; by F. A. Bremer, C. B. Alyea, Ralph Alyea and D. B. Fickle.

INDIANAPOLIS, IND.—The Keyless Lock Co. has been awarded a contract for document racks and files to be installed in the addition to the court house at Allentown, Pa.

INDIANAPOLIS, IND.—The Potts & Suits Mfg. Co. has been incorporated to manufacture and deal in oil heaters, stoves, furnaces; $25,000 capital stock; by Bert C. Suits, John F. Potts and Edward W. Hohit.

INDIANAPOLIS, IND.—A local court has accepted a bid of $110,000 for the plant of the H. J. Martin Forging Co. The Walker-Weiss Axle Co., Flint, Mich., was the successful bidder, and will operate the Indianapolis plant in connection with the works at Flint.

KOKOMO, IND.—Apperson Brothers will build a factory 151 x 344 feet.

KOKOMO, IND.—The Haynes Stellite Co. has been incorporated to manufacture a metal composition; $50,000 capital stock; by Elwood Haynes, automobile manufacturer, Richard Ruddell and James C. Patton.

MICHIGAN CITY, IND.—A bond issue of $75,000 has been authorized for water works improvements.

MUNCIE, IND.—The Hoosier Auto Parts Co., recently incorporated with $100,000 capital stock, by Carl H. Oesterly and others, will establish a foundry in the plant formerly occupied by the B. T. K. Gear Works.

OLDENBERG, IND.—Bids are being taken for a $22,000 power house by the Sisters of St. Francis. J. J. Reuchert, 8 Allen building, Cincinnati, O., is the architect.

PORTLAND, IND.—The Portland Forge & Foundry Co. will erect a new forge department, 50 x 120 feet, which will accommodate 12 hammers.

CHAMPAIGN, ILL. — The Caldwell Co. will build an addition to its plant for the manufacture of electric supplies.

CHICAGO.—The U. S. Ball Bearing Co., 2147 North Kolmer avenue, is to build a 1-story power house to cost $15,000.

CHICAGO.—The Electric Metal Refining Co. has been incorporated; $4,500 capital stock; by Walter Myer, Edward S. Glickauf and Bernard Stenge, 7 South Dearborn street.

CHICAGO.—The Chicago Utilities Mfg. Co. has been incorporated to manufacture machinery appliances; $25,000 capital stock; by Earle S. Peterson, Henry N. Miller and Charles F. Sperz, 2415 West Congress street.

HARVEY, ILL.—The Austin Mfg. Co., manufacturer of road grading machinery, is building a 2-story brick and steel factory to cost $30,000.

MOLINE, ILL.—The Moline Tool Co. will build an addition to its plant, to be of steel construction, 150 x 200 feet, with a sawtooth roof.

MONMOUTH, ILL. — The Western Boiler Pipe Co. has been incorporated; $100,000 capital stock; by J. H. Jayne, E. E. Wood and H. E. Miller.

WEST FRANKFORT, ILL.—Bids will be received until Nov. 22 by Ovid Dorris, city clerk, for the construction of a municipal water works system, including horizontal and vertical centrifugal pumps, electric motors, etc.

ALBION, MICH.—A special election will be held Dec. 14 on issuing $10,000 in bonds for the construction of a steam operated water works.

BUCHANAN, MICH.—Celfor Tool Co. will build an addition 136 x 300 feet. E. B. Clark is president of the company.

MUSKEGON, MICH.—A survey is being made for an electric railway from Muskegon to St. Johns, Mich., a distance of 110 miles.

PORT HURON, MICH.—The Grand Trunk railroad will build a car repair shop at Port Huron, costing $200,000.

STURGESS, MICH. — The Sturgess Steel Gocart Co. will award a contract shortly for a factory, two stories, 61 x 85 feet.

APPLETON, WIS.—Woodmansee & Davidson, consulting engineers, Chicago and Milwaukee, will take bids on or about Nov. 15, for the enlargement of the power plant of the Wisconsin Traction, Light, Heat & Power Co., at Appleton. The new building will be 70 x 100 feet.

BELOIT, WIS.—The Warner Trailer Co. is being organized by A. P. Warner, formerly head of the Warner Instrument Co., speed recorders and indicators, to manufacture a trailer for automobiles and motor trucks. The vehicle was developed following the sale of the Warner company to the Stewart interests, now operating the Stewart-Warner Speedometer Corporation.

EAU CLAIRE, WIS. — The Wisconsin-Minnesota Light & Power Co. has awarded the contract for the construction of a power dam costing about $2,000,000 to A. Guthrie & Co., St. Paul, Minn. The dam will be 3,900 feet long and is to be constructed across the Chippewa river north of Eau Claire. The general contractor is in the market for 60,000 barrels of Portland cement.

FOND DU LAC, WIS.—Articles of incorporation have been filed by the Organ Blowing Engineering Co., of Fond du Lac. The capital stock is $10,000 and the incorporators are J. K. Fagan, U. S. O'Rourke, W. H. Fagan, M. H. Fellenz and J. J. O'Rourke.

LADYSMITH, WIS.—The A. W. Schram Mfg. Co. will take bids through Thomas S. Watson Co., engineer, 1412 Majestic building, Milwaukee, on 22 motors, and other power equipment. The plant now being erected is of brick, four stories, 60 x 132 feet.

MANITOWOC, WIS.—An addition costing approximately $100,000 will be erected at once by the Aluminum Goods Mfg. Co., Manitowoc. Plans have been prepared by Earl F. Miller, architect, Dempsey block, for a 5-story steel and brick structure, 54 x 300 feet. The company has purchased a building site adjoining its works and proposes to erect a warehouse as soon as the factory addition is completed.

MELROSE, WIS.—Bids will be received until Dec. 1 by Z. W. Gilbert, village clerk, for the construction of a water works system.

MILWAUKEE.—The Northwestern Bridge & Iron Co., 127 South Water street, is building a foundry addition.

MILWAUKEE.—The Steel Horse Co. has been incorporated to manufacture gas and kerosene tractors; $25,000 capital stock; by William B. Reith, Walter D. Mann and Adolph C. Graf.

MILWAUKEE. — The Milwaukee Talking Machine Mfg. Co. has been organized in Milwaukee, by C. F. Romadka, H. V. Heaney and G. W. Goodman. The capital stock is $5,000.

MILWAUKEE.—The contract for the steel work on the new warehouse and shipping room of the Geo. H. Smith Steel Casting Co., 500 Clinton street, has been awarded to the Wisconsin Bridge & Iron Works, Milwaukee.

MILWAUKEE. — The Standard Crucible Steel Casting Co., 719-725 Thirtieth street, will enlarge its foundry. Plans are being prepared by Theodore Schutz, architect, for a brick and concrete addition, 40 x 40 feet and will be ready about Dec. 15.

MILWAUKEE.—The Nunn & Bush Shoe Co., now occupying leased quarters at 409-419 Third street, Milwaukee, is having plans prepared by Herman J. Esser, architect, Camp building, for a permanent location at Hadley and Fifth streets. The factory will be six stories, with ells, 117 x 149 feet, of steel and brick, with mill floors. The power plant will be two stories, 30 x 60 feet.

MILWAUKEE. — The A. J. Lindemann-Hoverson Co., Midland and Cleveland avenues, Milwaukee, manufacturer of stoves and sheet metal work, has awarded contracts for the erection of a new enameling shop to cost about $25,000. It will be of brick construction, 135 x 160 feet, one story. The company recently refused to bid for a quantity of small sheet metal stoves for trench use, because of the rush of domestic business.

PRAIRIE DU SAC, WIS. — Preliminary plans are being prepared by M. W. Torkleson, engineer, for a bridge 600 feet long over the Wisconsin river to cost $70,000.

SHAWANO, WIS.—A special election will be held shortly on bonding the city for $60,000 for the construction of a dam and hydro-electric plant on Wolf river to serve as a municipal electric light and power plant.

SOUTH MILWAUKEE, WIS.—Plans being prepared for the forging shop of the Bucyrus Co., South Milwaukee, call for a steel and brick structure, 70 x 150 feet. The company is contracting for presses and other equipment.

STURGEON BAY, WIS. — R. C. Totzke, president of the Sturgeon Bay Fruit Package Co., has organized the Wisconsin Folding Box Co., of Sturgeon Bay, which will specialize in folding packages for general purposes. E. B. Olson is president and F. W. Bebo is vice president of the company, which is capitalized at $30,000. A factory will be

built if the concern is unable to lease suitable quarters.

KANSAS CITY, MO.—The Kansas City Radiator Co. will build a foundry 75 x 120 feet to cost $11,000.

SPRINGFIELD, MO. — The Springfield Gasoline Iron Co. has been incorporated $15,000 capital stock; by H. H. Cole, Rose Keifer and Anna Kiefer.

ST. LOUIS.—The American Shoe Machinery & Tool Co. has increased its capital stock from $30,000 to $250,000.

ST. LOUIS.—Considerable saw mill equipment will be needed by the C. F. Liebke Hardwood Mill & Lumber Co., which will re-build its plant which was damaged by fire recently at a loss of $75,000.

ST. LOUIS.—The T. D. Davis Mfg. Co. has been incorporated to manufacture steel, copper and other metal devices; $30,000 capital stock; by Harvey E. Brown, George H. Allan, Ralph McKittrick and Thomas McKittrick.

ST. LOUIS. — The Siemers-Marshall Engineering Co. has been incorporated to manufacture heating and ventilating equipment; $15,000 capital stock; by George F. Siemers, Benjamin W. Marshall and Oliver Frazier.

HOLSTEIN, IA.—Bonds for $18,000 have been voted for a water works system. Albert G. Markley is city recorder.

MARSHALLTOWN, IA. — The La Plant Co., manufacturer of warm air furnaces, will erect a foundry, 60 x 200 feet, of brick or concrete, which will be equipped for the production of furnace castings.

ST. PAUL.—St. Paul Hotel Co. is having plans prepared by A. N. Stein, architect, 601 Endicott building, for a hotel addition, 12 stories, 50 x 90 feet.

SOUTHERN STATES

ALEXANDRIA, LA.—Ruston Foundry & Machine Shops will rebuild its plant recently damaged by fire including a 60 x 100-foot foundry with equipment. The company makes gray iron and semi-steel castings. A. W. McMichael is manager.

BEAUMONT, TEX.—Bids will be received until Nov. 15, postponed date, by J. F. Keith, president of the board of wharves and docks, for two traveling gantry jib cranes and two traveling cranes with movable tracks and overhead carriers.

GALVESTON, TEX.—The law authorizing the sale of 87 acres of submerged land in the west end flats in Galveston, requires that the purchasers shall spend at least $150,000 in improvements on the property. J. J. Kane and associates of Galveston, the purchasers, plan to build dry docks and make other improvements at a cost much in excess of the amount required by the state.

HOUSTON, TEX. — Bids will be received soon by the county engineer for a bridge over Brays bayou, costing $35,000.

TEMPLE, TEX.—Water commissioners are considering installing an electrically-driven pump at the municipal plant at a cost of $16,000.

MORRILLTON, ARK.—D. H. Smith Iron Fence Post Co. has been incorporated; $20,000 capital stock; by G. C. Martin, president, C. E. Simpson, vice president and S. A. Simpson, manager. This concern is asking for bids on manufacturing iron posts.

PIGOT, ARK.—Bonds for $40,000 have been voted for a water works system, including two motor-driven pumps, reinforced concrete reservoir, 40,000 feet of 4, 6 and 8-inch cast iron pipe. A. C. Moore, Joplin, Mo., is the engineer.

BENTON, TENN.—The proposed bond issue of $10,000 for a municipal water works system was defeated at the recent election.

CAMDEN, TENN.—Arrangements are being made to build a water works plant some time shortly after the first of the year. The mayor has detailed information.

CLEVELAND, TENN. — The Cleveland Table & Mantel Co. has been organized with D. W. Kegler as manager. Equipment will be installed in mill now under construction.

JACKSON, TENN.—The Jackson Butchers' Association has had plans prepared for the establishment of an abbatoir. Refrigerating and other equipment will be required.

JELLICO, TENN. — The Zickgraf-Jenson Lumber Co. will be in the market shortly for wood working machinery as well as steam power equipment for installation in its planing mill.

JOHNSON CITY, TENN.—Plans have been prepared for enlarging the capacity of the plant of the Union Tanning Co. W. H. Gildersleeve is manager.

KINGSPORT, TENN.—W. C. Hattan, of Kingsport, has been engaged by the municipality to prepare plans for the construction of a waterworks system, the estimated cost of which is about $10,000.

KNOXVILLE, TENN. — The Knoxville Spinning Co. has increased its capital stock from $50,000 to $100,000 and will increase the capacity of its plant. L. D. Tyson is president of the concern.

MARYVILLE, TENN.—The Aluminum Co. of America, Pittsburgh, is erecting a furnace building at its Maryville plant, which will be increased 25 per cent in capacity.

MARYVILLE, TENN.—F. D. Liscomb has been awarded a contract for the construction of a water works system and is purchasing equipment.

PARIS, TENN.—P. H. Russell and F. C. Hightower, Jackson, Tenn., will purchase electric motors and special automatic machinery for use in a bottling plant to be erected near Paris.

CLEVELAND, OKLA. — An election will be held soon on issuing $125,000 in bonds for a water works system, including 50,000 feet of cast iron pipe, 4, 6, 8 and 10-inch; 19,000 feet of 10-inch flow line; a 150,000-gallon tank on an 80-foot tower; 3 miles of transmission line; two 500-gallon per minute motor driven centrifugal pumps. A. C. Moore, engineer, Joplin, Mo.

WESTERN STATES

ELLENDALE, S. D.—An election will be held Nov. 30 on issuing $9,000 in bonds for a water works system including tanks, pumps and reservoirs.

LITTLE RIVER, KAS.—Bonds for $16,000 have been voted for an electric light plant. Plans are being prepared. L. Roy Jacks is city clerk.

OAKLEY, KAS.—Bids will be received until Nov. 23 by J. A. Schwitzer, city clerk, for the construction of a power plant. G. P. Taylor, Stockton, is engineer.

OSWEGO, KAS.—An election will be held Nov. 12 on issuing $30,000 in bonds for water works extensions including a 100,000-gallon elevated tank on a 100-foot tower, 7,500 feet of cast iron pipe and a filtration plant. A. C. Moore, engineer, Joplin, Mo.

TOPEKA, KAS.—Commissioners of Shawnee county are to spend $30,000 for new bridges.

TOPEKA, KAS.—The Cushman Gas Engine Co., capitalized at $75,000, will locate at Topeka and operations will be started shortly after Jan. 1.

GLENDIVE, MONT.—Burns & McDonnell, engineers, Scarritt building, Kansas City, Mo., are preparing plans for improvements to the water works costing $70,000.

THERMOPOLIS, WYO.—Bonds for $40,000 have been voted for the construction of a water works system.

DENVER.—Austin Daly Co. is planning an addition and will install machinery. The estimated cost of construction is $100,000.

ABERDEEN, IDA. — The public utilities commission has given the city permission to build a municipal water system, including a pumping station, a steel tank on a 100-foot tower and pipe lines.

CANADA

MONTREAL, QUE.—The Eastern Machinery Co., Ltd., has been incorporated; $45,000 capital stock; by Armand Lalonde, Emile A. Lalonde and D. L. Desbrois.

MONTREAL, QUE.—The Renown Engine & Machine Co., Ltd., has been incorporated; $50,000 capital stock; by Leslie H. Boyd, Alexander R. Johnson and Arthur Ross.

MONTREAL, QUE. — The Lacliance Nut Lock Co., Ltd., has been incorporated to manufacture steel products; $300,000 capital stock; by Joseph A. Bilodean, Maurice Loranger and Bernard Melancon.

MONTREAL, QUE. — The Laurentide Power Co., Ltd., of Montreal, has been incorporated to erect a power plant; $10,500,000 capital stock; by Warwick T. Chapman, W. R. L. Shanks and Daniel P. Gillmor, all of Montreal.

CHATHAM, ONT. — The American Well Works Co., of Aurora, Ill., has purchased the plant of the Defiance Iron Works. The company has been awarded several contracts from Canadian sources.

TORONTO, ONT.—The National Steel Car Co., of Canada, has been awarded a contract for 1,000,000 steel shell forgings for the British government.

TORONTO, ONT.—The Steel & Radiation Co. has been incorporated; $5,000,000 capital stock; by James S. Lovell, Robert Gowans and Joseph J. Dashwood.

TORONTO, ONT.—The Diaphone Signal Co., Ltd., has been incorporated to manufacture signaling devices; $825,000 capital stock; by Gideon Grant, Bruce Williams and Edwin Smily.

TORONTO, ONT.—The Canadian Gahagan Construction Co. has been incorporated to carry on business as general contractors and engineers; $100,000 capital stock; by John S. Denison, Frank J. Foley and E. J. McNaught.

TORONTO, ONT. — The National Steel Products Co., Ltd., has been incorporated to manufacture munitions, etc.; $100,000 capital stock; by Joseph G. Gibson and Ernest P. Seon.

TORONTO, ONT.—The Manual Construction Co., Ltd., has been incorporated to manufacture light hardware; $40,000 capital stock; by John A. Chandler, Ernest W. Chandler and Mary Hodgson.

TORONTO, ONT.—The Canadian Tygard Engine Co. has purchased a site for a plant at Kingston road and Lawlor avenue. Present buildings will be used as factory and an addition erected.

WALKERVILLE, ONT. — The Canadian Bridge Co. has been incorporated to engage in bridge building and structural iron and steel work; $2,000,000 capital stock; by Francis C. McMatle, Willard Pope, Detroit, and Charles T. Miller, Walkerville.

IRON AND STEEL PRICES

Corrected up to Tuesday noon

PIG IRON

(Delivery to Dec. 31.)

Bessemer, valley	$16.00 to 16.50
Bessemer, Pittsburgh	16.95 to 17.45
Basic, Pittsburgh	16.45
Basic, eastern Pa.	17.75 to 18.00
Malleable, Pittsburgh	15.95 to 16.45
Malleable, first half, Pbgh.	15.95
Malleable foundry, Chicago	17.00
Malleable foundry, Philadelphia	17.25 to 17.75
Malleable foundry, Buffalo	16.50
No. 1X foundry, Philadelphia	16.75 to 17.00
No. 2 foundry, Pittsburgh	15.95 to 16.95
No. 2 fdy., first half, Pbgh.	15.95 to 16.45
No. 2 foundry, first half, valley	15.00 to 15.50
No. 2 foundry, Cleveland	16.30
No. 2 foundry, Ironton	16.00
No. 2 foundry, Chicago	17.00
No. 2X foundry, Philadelphia	16.50 to 17.00
No. 2X fdy., N. J. tidewater	16.50 to 17.00
No. 2X foundry, Buffalo	16.50
No. 2 plain, Philadelphia	16.25 to 16.50
No. 2 plain, N. J. tidewater	16.25 to 16.50
No. 2 plain, Buffalo	16.00
No. 2 southern, Birmingham	13.00 to 13.50
No. 2 southern, Cincinnati	15.90 to 16.40
No. 2 southern, Chicago	17.00
No. 2 southern, Phila. delivery	17.00 to 17.50
No. 2 southern, Cleveland	17.00 to 17.50
No. 2 south'n, New York docks	17.00 to 17.50
No. 2 southern Boston, docks	16.25 to 16.75
No. 2 south. interior, New Eng.	18.00 to 19.00
No. 2 southern, St. Louis	15.90
Virginia No. 2X furnace	14.50 to 15.00
Virginia 2X, Philadelphia	16.75 to 17.25
Virginia 2X, Jersey City	17.60 to 18.10
Virginia 2X, Boston points	17.75 to 18.25
Gray forge, eastern Pa.	15.75 to 16.00
Gray forge, Pittsburgh	15.70 to 15.95
Gray forge, Birmingham	10.50
Silveries, 8 per cent, Jackson, O.	20.00 to 20.50
Silveries, 5 per cent Birmingham	13.25 to 13.50
Silveries, 8 per cent, Chicago	20.00 to 20.50
Standard low phos., Phila.	28.50 to 29.00
Lebanon low phos., furnace	25.00
Low Phos., Pittsburgh	29.00 to 29.50
Charcoal, Lake Superior, Chgo., Nos. 1 to 4	17.25 to 17.75
Charcoal, Buffalo	18.00 to 19.00
Charcoal, Birmingham	21.50

IRON ORE

Lake Superior Ores.
(Lower Coke Reports.)

Old range Bessemer, 55 per cent.	$3.75
Mesabi Bessemer, 55 per cent.	3.45
Old range, non-Bess., 51½ per cent.	3.00
Mesabi non-Bessemer, 51½ per cent.	2.80

Foreign Ores.
(Per unit Philadelphia.)
(Prices nominal.)

Foreign Bess., 50 to 65 per cent.	8 to 8½
For'n non-Bess., 50 to 65 per cent.	8 to 8½

COKE

(At the ovens.)

Connellsville furnace	$2.70 to 2.75
Connellsville fur., first half	2.35 to 2.50
Connellsville foundry	3.00 to 3.25
Connellsville fdy. contr.	3.00 to 3.25
Wise county furnace	2.60 to 3.00
Wise county foundry	3.00 to 3.25
Pocahontas furnace	2.60 to 3.00
Pocahontas foundry	3.00 to 3.25
New River, foundry	3.25 to 3.75
New River, furnace	3.00 to 3.25

FERRO ALLOYS AND STEEL MAKING METALS

Ferro mang., delivered (prompt)	98 to 100
Ferro mang., Balti., (future)	100.00
Spiegeleisen 20 per cent, furnace	28.00
Ferro-silicon, 50 per cent, Pbgh.	83.00 to 85.00
Ferro-silicon, 50 per cent, Phila.	85.00 to 87.00

Bessemer ferro-silicon, 9 per cent to 10 per cent, $22.00; 10 to 11 per cent, $23.00; 11 to 12 per cent, $24.00; 12 to 13 per cent, $25.00 a ton at the furnace at Ashland, Jackson and New Straitsville, O.

Ferro-chrome, 4 to 6 per cent carbon, 25 cents per pound; 2 per cent carbon, 45 cents per pound, delivered.

Ferro-vanadium, $3.15 per pound of contained alloy, Pittsburgh.

Ferro-carbon titanium, 8 to 12½ cents per pound in carloads.

Nickel, 50 to 55 cents per pound.

Freight Rates via Panama Canal

Rates on finished materials, including plates, shapes, bars, wire, nails, etc., to Pacific coast points via Panama canal, per 100 lbs., in carload lots, exclusive of insurance and dockage.

From New York	$0.40
From Pittsburgh	.619
From Youngstown	.619
From Niles	.619
From Wheeling	.619
From Steubenville	.619
From Johnstown	.604
From Coatesville	.545
From Steelton	.555
From Bethlehem	.529
From Cleveland	.65
From Chicago	.765

Ferro-tungsten, nominal.

Cobalt metal, $1.60 to $1.75 per pound, Pittsburgh.

Aluminum, 55 to 56 cents per pound, New York.

Ferro-molybdenum, Pittsburgh, nominal.

SEMI-FINISHED STEEL

Open hearth billets, Phila.	$32.00 to 34.00
Bessemer billets, Phila.	28.00
Forging billets, Phila.	40.00 to 50.00
Forging billets, Pbgh.	40.00
Forging billets, Chgo.	32.00 to 34.00
Wire rods, Pittsburgh (nom.)	34.00 to 35.00
Bess. bill., Youngstown	26.00
Open hearth billets, Youngstown	28.00 to 30.00
Bessemer billets, Pittsburgh	28.00
Open hearth billets, Pittsburgh	28.00
Bess. sheet bars, Youngstown	28.00 to 30.00
Op. h'th sheet bars, Youngstown	28.00 to 30.00
Bess. sheet bars, Pittsburgh	28.00 to 30.00
Op. h'th sh. bars, Pbgh.	28.00 to 30.00
Muck bar, Pittsburgh (nominal)	30.00

RAILS AND TRACK MATERIAL

Stand. Bess., rails, Pbgh. & Chg.	1.25c
Stand. op-h'th rails, Pbg. & Chg.	1.34c
Light rails 8 to 10 lbs., Pbgh.	1.60c
Light rails, 8 lb. Chgo.	1.49c
Light rails 12 to 14 lbs. Pbgh.	1.55c
Light rails, 12 lbs. Chgo.	1.44c

Freight Rates, Pig Iron

Mahoning and Shenango valleys to:—	
Cleveland	$0.95
Newark, N. J.	2.98
Boston	3.18
Philadelphia	2.78
Pittsburgh	.95
St. Louis	3.18
Buffalo to:—	
Albany, N. Y.	$1.26
New England (all rail)	2.58
New York and Brooklyn (all rail)	2.58
New York and Brookyln (by canal)	1.25 to 1.60
Virginia furnaces to:—	
Boston docks (r. and w.)	$3.05
New England (all rail)	3.25
New York dock (r. and w.)	2.88
Birmingham, Ala., to:—	
Cincinnati	$2.90
Chicago	4.00
Cleveland	4.00
Louisville, Ky	2.65
New York (all rail)	6.15
New York (rail and water)	4.25
Philadelphia (all rail)	5.20
Philadelphia (rail and water)	4.00
Pittsburgh	4.90
Savannah, Ga.	2.75
Chicago to:—	
Des Moines	$2.80
Milwaukee	.50
Moline, Ill	1.40
Omaha	3.58
St. Louis	1.58
Ironton and Jackson, O., to:—	
Chicago	$2.54
Cincinnati	1.26
Cleveland	1.62
Detroit	1.81
Indianapolis	1.58

Light rails 16 to 20 lbs., Pbgh.	1.50c
Light rails 16 to 20 lbs., Chgo.	1.39c
Light rails 25 to 45 lbs., Pbgh.	1.45c
Light rails 25 to 45 lbs., Chgo.	1.34c
Relaying rails, standard, Pbgh. & Chgo.	$23.00 to 24.00
Relaying rails, light, Chgo.	21.50 to 22.50
Angle bars, st. sect., Pbgh. base.	1.50c to 1.75c
Angle bars, st. sections, Chicago	1.50c to 1.75c
Spikes, railroad, Pbgh.	1.85c
Spikes, railroad, Chgo.	1.80c to 1.90c
Track bolts, Pbgh.	2.25c
Track bolts, Chgo.	2.30c to 3.40c
Tie plates, Chgo.	34.00 to 35.00

SHAPES, PLATES AND BARS

Structural shapes, Pbgh.	1.60c
Structural shapes, Chgo.	1.79c
Structural shapes, Philadelphia	1.759c to 1.859c
Structural shapes, New York	1.669c to 1.719c
Struc. shapes, San Francisco	2.00c to 2.05c
Tank plates, Chgo.	1.79c
Tank plates, Pittsburgh	1.60c
Tank plates, Philadelphia	1.759c to 1.859c
Tank plates, New York	1.669c to 1.869c
Bars, soft steel, Pittsburgh	1.60c
Bars, soft steel, Chgo.	1.79c
Bars, soft steel, Philadelphia	1.759c
Bars, soft steel, New York	1.669c
Hoops, carloads, Pittsburgh	1.75c
Bands, Pittsburgh	1.60c
Shafting, Pbgh., contr. carloads	55 off
Bar iron, Chgo.	1.45c
Bar iron, Philadelphia	1.559c to 1.609c
Bar iron, New York	1.569c to 1.619c
Bar iron, Cleveland	1.50c to 1.55c
Bar iron, Pittsburgh	1.60c
Hard steel bars, Chicago	1.45c to 1.50c
Smooth fin., mchy. steel, Chi.	1.68c

SHEETS AND TIN PLATE

No. 28, black, Pittsburgh	2.20c to 2.35c
No. 28, black, Chgo.	2.44c
No. 28, tin mill, black, Pbgh.	2.15c to 2.30c
No. 28, galvanized, Pbgh.	3.70c to 3.80c
No. 28, galvanized, Chgo.	2.99c
No. 10, blue anld., Pbgh.	1.70c to 1.80c
No. 10, blue annealed, Phila.	1.959c to 2.009c
Tin plate, 100 lb., coke base	$3.10 to $3.20

EXTRAS FOR SHEET OR TIN MILL SPECIFICATIONS

(Per hundred pounds.)

Single pickled, cold roll, and re-anl.	30 cents
Hot roll'd pick'd and anl., tin mill	25 cents
Full pickl'd, cold rolled and re-anl.	50 cents
Auto sheets	75 cents
Blued stove pipe stock	10 cents
Range steel	30 cents
Re-squaring	10 cents
Roller leveling	10 cents
Patent leveling and re-squaring	35 cents
Oiling sheets	10 cents
Deoxiding	10 cents
Lime finish	10 cents
Open-hearth stamping steel, free fr. mill scale	55 cents
Special open hearth deep stpg. steel free from mill scale	80 cents
Extra deep special auto body stock.	$1.25
Ext. for 28 gage ov. 32 to 36-in. wide	10 cents

No reduction for sheets not annealed.

The above extras apply on both sheet and tin mill specification, at the same rate.

IRON AND STEEL PIPE

(Pittsburgh.)

	Black. Butt-weld	Galv. Butt-weld
Steel, ¾ to 3 inches	78	63½
Iron, ¾ to 2½ inches	70	52
	Lap-weld.	
Steel, 2½ to 6 inches	77	62½

BOILER TUBES

Steel, 3½ to 4½ inches l. c. l.	69
Iron, 3½ to 4½ inches l. c. l.	57

WIRE PRODUCTS

(Retailers' price 5 cents above jobbers' quotation.)

Wire nail jobbers, Pittsburgh	$1.85
Plain wire, jobbers, Pittsburgh	1.70
Galvanized wire, jobbers, Pbgh.	2.40
Polished staples, Pbgh.	2.00
Galvanized staples, Pbgh.	2.70
Barb wire, painted, jobbers, Pbgh.	2.00
Barb wire, galv., jobbers, Pbgh.	2.70